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Studies of West Indian plants — II

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7. HARRISIA, A NEW GENUS OF CACTACEAE

Night-flowering cacti with slender upright branched cylindric stems, the branches fluted, with from 8 to 11 rounded ribs, separated by shallow grooves and bearing areoles at frequent intervals, each areole with several acicular spines. Flowers borne singly, at areoles near the ends of the branches, funnelform, large, with a cylindric scaly but spineless tube as long as the limb or longer; buds globose, ovoid or obovoid, densely scaled, the scales bearing long or short woolly hairs; sepals pink or greenish, linear-lanceolate; petals white; stamens shorter than the petals, style somewhat longer than the stamens; fruit globose to ovoid-globose, green to yellow, spineless but with deciduous scales, the corolla withering-persistent; seeds very numerous, small.

The genus is named in honor of William Harris, Superintendent of Public Gardens and Plantations of Jamaica, distinguished for his contributions to the knowledge of the flora of that island. The descriptions are drawn up mainly from field observations and from living plants in the collections of the New York Botanical Garden.

Bud-scales densely covered with hairs 1–1.5 cm. long.
- Hairs bright white; areoles 2.5–3 cm. apart; spines 6–9, the longer 2.5–3 cm. long. — 1. *H. eriophorus.*
- Hairs tawny; areoles 2–2.5 cm. apart; spines 8–11, the longer 1 cm. long. — 2. *H. Fernowi.*

Bud-scales loosely covered with hairs 3–10 mm. long.
- Buds rounded-truncate. — 3. *H. portoricensis.*
- Buds pointed.
  - Plant dark green; hairs of the bud-scales straight. — 4. *H. gracilis.*
  - Plants light green; hairs of the bud scales curled.

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Spines 3–6, the longer 1.5 mm. long; buds obovoid, very short-pointed. 5. *H. Nashii.*
Spines 9–15; buds ovoid to subglobose.
Areoles 1 cm. apart; spines 1 cm. long. 6. *H. undata.*
Areoles 2–3 cm. apart; longer spines 2–5 cm. long.
Buds ovoid, long-pointed; longer spines 2.5 cm. long. 7. *H. Brookii.*
Buds subglobose, short-pointed; longer spines 4–5 cm. 8. *H. Taylori.*

1. **Harrisia eriophora** (Pfeiff.)

Cereus cubensis Zucc.; Seitz, Allg. Gartenz. **2**: 244. 1834. [Hyponym.]

Cereus eriophorus Pfeiff. Enum. 94. 1837.

Plant rather light green, the main stem 4 cm. in diameter or more, the branches nearly as thick, erect-ascending, 8-ribbed or 9-ribbed, the ribs prominent, the depressions between them rather deep. Areoles 3–4 cm. apart; spines 6–9, the longer ones 2.5–4 cm. long, light brown with nearly black tips; buds ovoid, sharp-pointed, their scales densely covered with bright white woolly hairs 1–1.5 cm. long; flower about 18 cm. long; scales of the tube lanceolate, acuminate, appressed, 1–1.5 cm. long, bearing long white hairs; sepals pale pink outside, the outer greenish; petals pure white, tipped with a hair-like cusp 5 mm. long; filaments white; anthers oblong, yellow; pistil cream-colored.

Description from N. Y. B. G. *no. 28933*, collected by C. F. Baker at Cajimar, Cuba, in 1907.

TYPE LOCALITY: Cuba.

DISTRIBUTION: Cuba.

ILLUSTRATION: Pfeiff. & Otto, Abb. u. Beschr. Cact. *pl. 22.*

2. **Harrisia Fernowi** sp. nov.

Plant 2.5–3 m. high; branches slender, about 2.5 cm. thick, light green, 9-ribbed, the ribs not prominent, the depressions between them shallow. Areoles about 2 cm. apart; spines 8–11, light brown with blackish tips, the longer ones 1 cm. long; bud subglobose-ovoid, its scales rather densely covered with tawny curled woolly hairs 1 cm. long; flower nearly 2 dm. long.

Cereus pellucidus Griseb. Cat. Pl. Cub. 116. 1866. Not *C. pellucidus* Otto. 1837.

Description mainly from N. Y. B. G. *no. 25766*, collected by Norman Taylor (*no. 254*), between Rio Grande and Rio Ubero, in

eastern Cuba in company with Prof. B. E. Fernow, in 1906; collected also by C. Wright, near Guantanamo.

3. **Harrisia portoricensis** sp. nov.

Plant slender, 2–3 m. high, little branched, the branches 3–4 cm. thick, 11-ribbed, the ribs rounded, the depressions between them shallow. Areoles 1.5–2 cm. apart; spines 13–17, grayish white to brown with dark tips, the longer ones 2.5–3 cm. long; bud obovoid, depressed-truncate, its scales with many curled white hairs 6 mm. long or less; flower about 1.5 dm. long; sepals pinkish green inside; scales of the corolla-tube lanceolate, appressed, 1.5 cm. long, loosely hairy, the hair completely deciduous in flakes; fruit ovoid, yellow, tubercled, acuminate at the apex, rounded at the base, 4 cm. long, 3 cm. in diameter.

Description from N. Y. B. G. *no. 24653*, collected by N. L. Britton and John F. Cowell, near Ponce, Porto Rico (*no. 1324*), in 1906.

4. **Harrisia gracilis** (Mill.)

Cereus gracilis Mill. Gard. Dict. ed. 8, no. 8. 1768.

Cereus repandus Haw. Syn. Pl. Succ. 183. 1812. Not *Cereus repandus* L.

? *Cereus subrepandus* Haw. Suppl. Pl. Succ. 78. 1819.

Plant much branched, often 7 m. high, dark green, its branches rather slender, somewhat divergent, 9–11-ribbed, the ribs rounded, the depression between them rather shallow. Areoles 1.5–2 cm. apart; spines 10–16, whitish with black tips, the longer 2–2.5 cm. long; bud oblong-ovoid, short-pointed, its scales with a few straight white hairs 8–12 mm. long; corolla 2 dm. long, the scales of its tube greenish brown, narrowly lanceolate, abruptly bent upward near the base, acuminate, about 2 cm. long, having a few hairs, the sepals pale brown, the petals white; fruit depressed globose, yellow, about 5 cm. long, 6–7 cm. thick, the base flat, the top bluntly pointed, strongly tubercled when young, the tubercles low-conic, about 4 mm. high, about 1.5 cm. from tip to tip, bearing a deciduous triangular-lanceolate scale 6–8 mm. long, becoming confluent, the fruit finally smooth or nearly so.

Description from N. Y. B. G. *no. 21902*, collected in Jamaica by Mr. John F. Cowell in 1904, and from *Britton 1255*, Great Pedro Bay, Jamaica. This plant has been observed by me in great quantities in the arid districts of the southern part of Jamaica, and is represented in our collections by living specimens from six localities. I designate this species as the type of the genus.

TYPE LOCALITY: British Islands of America.

DISTRIBUTION: Jamaica.

Harrisia gracilis has been illustrated as follows: Trew, Pl. Select. *pl. 14;* Bot. Reg. *pl. 336*, as *Cactus repandus;* DC. Mém. Mus. Paris **17**: *pl. 3*, as *Cereus repandus.*

5. **Harrisia Nashii** sp. nov.

Branches widely divergent, light green, 3–4 cm. thick, 9–11-ribbed, the ribs rounded. Areoles 2–2.5 cm. apart; spines only 3–6, gray, the longer ones 15 mm. long; bud narrowly obovoid, obtuse, very short-pointed, its scales with many curled white hairs 6 mm. long or less; corolla 1.6 dm. long; scales of the corolla-tube linear, acuminate, 1.5 cm. long, bearing a few hairs; fruit ellipsoid, 6–8 cm. long. 4–5 cm. thick, very strongly tubercled, the conic tubercles 6–8 mm. high.

Description from N. Y. B. G. *no. 24089*, collected between Gonaives and Plaisance in Haiti by G. V. Nash and Norman Taylor (*no. 1765*), in 1905.

ILLUSTRATION: ? Descour. Fl. Med. Ant. **1**: *pl. 66*, as *Cactus divaricatus.*

6. **Harrisia undata** (Pfeiff.)

Cereus undatus Pfeiff. Enum. Cact. 94. 1837.

Plant branched, about 2 m. high, the older branches light green, 10-ribbed, the ribs rounded, the depressions between them shallow; young branches dark green, only about 2 cm. thick. Areoles only 1 cm. apart; spines 12–15, gray, the longer ones only 1 cm. long; bud small, ovoid, short-pointed, its scales with few somewhat curled hairs 4–6 mm. long; flower (according to Pfeiffer and Otto) about 1.5 dm. long, the tube green, covered with acute loosely woolly scales, the petals white, denticulate.

Description from N. Y. B. G. *no. 19263*, obtained by N. L. Britton from the Havana Botanic Garden in 1903 (*no. 502*), and determined as *Cereus undatus* Pfeiff. by the description.

DISTRIBUTION: Cuba.

ILLUSTRATION: Pfeiff. & Otto, Abb. u. Beschr. Cact. *pl. 23*, which shows the areoles farther apart than they are in our living plants.

7. **Harrisia Brookii** sp. nov.

Plant 5 m. high, much branched, light green; branches 3–4 cm. thick, 10-ribbed, the ribs very prominent, with deep depressions between them. Areoles about 2 cm. apart; spines 9–12,

the longer ones 2–2.5 cm. long; bud ovoid, prominently long-pointed, its scales with few curled white hairs 7–10 mm. long; fruit yellowish, ellipsoid, about 8 cm. long, 5–6 cm. thick, rounded at both ends, the tubercles very low, with tips only 1.5 mm. high.

Description from N. Y. B. G. *no. 2614*, collected at Georgetown, Long Island, Bahamas, by N. L. Britton and C. F. Millspaugh, in 1907 (*no. 6337*). Named in honor of Hon. Herbert A. Brook, Registrar of the Bahamas, in recognition of his valuable aid in our exploration of these islands.

The plant of Florida, of which I do not yet know the buds or the flowers, more closely resembles this Bahamian species in its spines and areoles than it does any of the others here described. Our living plant, N. Y. B. G. *no. 19900*, was collected by Prof. P. H. Rolfs on islands east of Malabar and brought to the Garden by Dr. J. K. Small in 1903. As shown by an herbarium specimen, prepared by Dr. Small at that time (*no. 78*), the fruit of this species is nearly globular, about 5 cm. in diameter, and apparently smooth or nearly so. We also have an excellent photograph, taken by Mr. C. L. Pollard on Key Largo; and Curtiss' N. A. Plants *no. 963*, from a locality between the Indian River and the ocean, is this same species, which is described in Chapman's Southern Flora, at least in so far as the flower is concerned, under the name *Cereus monoclonos*, but it is not *C. monoclonos* of De Candolle.

8. **Harrisia Taylori** sp. nov.

Plant light green, branched above, 1.5–2 m. high, the branches divaricate-ascending, rather stout, 4 or 5 cm. thick, 9-ribbed, the ribs rounded, the depressions between them rather deep. Areoles 2–3 cm. apart; spines 9–12, the longer 3–5 cm. long, ascending; bud globose-ovoid, short-pointed, its scales with sparse curled grayish-white wool 3–6 mm. long.

Description from N. Y. B. G. *no. 25767*, collected by Norman Taylor on the sea-beach between Rio Grande and Rio Ubero, in in eastern Cuba, in 1906 (*no. 253*).

9? CEREUS DIVARICATUS Lam. Encycl. **1**: 540. 1783.

Cereus divergens Pfeiff. Enum. 95. 1837.

Pilocereus divaricatus Lemaire, Rev. Hort. **1862**: 427. 1862.

TYPE LOCALITY: Santo Domingo.

DISTRIBUTION: Santo Domingo and Haiti.

ILLUSTRATION: Plumier, Pl. Amer. ed. Burmann, *pl. 193*.

Known only from Plumier's description and illustration; it may belong to the genus *Harrisia*, — although the long-exserted style seems to preclude it.

10? CEREUS ERECTUS Karw.; Pfeiff. Enum. 95. 1837.

TYPE LOCALITY: Mexico.

Referred in synonymy by Schumann to *Cereus repandus*, that is to say, presumably a *Harrisia*. Known only from the description.

Cereus repandus L., originally from Curaçao, is, from the description, presumably a *Cephalocereus*.

8. POTOMORPHE PELTATA (L.) MIQ.

POTOMORPHE PELTATA (L.) Miq. Comm. Phyt. 37. 1838.

Piper peltatum L. Sp. Pl. 30. 1753.

Piper umbellatum L. Sp. Pl. 30. 1753.

Potomorphe umbellata Miq. Comm. Phyt. 31. 1838.

Field observations in Jamaica demonstrate that the two supposed species of *Potomorphe* are not distinct. The difference of peltate and non-peltate leaves depended upon by Linnaeus and most subsequent authors who have had occasion to describe these plants, including M. Casimir de Candolle (in Urban, Symb. Ant. **3**: 208–211), is worthless, because individual plants bear both kinds of leaves. I had long suspected this to be the case, and while discussing the matter with Mr. William Harris on the road from Bath to Cuna Cuna Gap last September, where specimens of both supposed species were abundant, he almost immediately detected a plant which bore peltate leaves at its upper nodes and non-peltate leaves at the lower ones, and we found a plenty of such specimens afterwards (*Britton 3513*). The relative number of spikes, which also has been supposed to differentiate the species, I had previously found to be quite inconstant, and the character of pubescence used in the descriptions by M. de Candolle is also inconstant, as evidenced by his proposing a hairy variety of *P. peltata* (*loc. cit.* 210, as *Piper peltatum hirtellum* C. DC.).

M. de Candolle includes the species in the genus *Piper*, and describes them as shrubs up to 4 meters high. As a matter of fact, the plant is not properly a shrub, its stems being soft, not

appreciably woody; his principal character to distinguish *Piper* from *Peperomia* is that *Piper* consists of shrubs and trees and *Peperomia* of herbs; *P. peltata* should then be excluded from *Piper*, and as it has distinct habital characteristics, differing widely from any true Pipers or Peperomias, I think it better regarded as a distinct genus under Miquel's name *Potomorphe*. Kunth, and also A. Dietrich, allowed it in *Peperomia*.

9. THE GENUS STEGNOSPERMA BENTH.

Stegnosperma was established by Bentham (Bot. Voy. Sulphur 17. *pl. 12.* 1844) with the single species *S. halimifolium* Benth. from Cape St. Lucas, Lower California. The next year, A. Richard (Ess. Fl. Cub. 632. 1845) proposed an additional species, *S. cubense* A. Rich. from Cuba. Moquin (in DC. Prodr. **13**[2]: 36. 1849) makes no mention of the Cuban plant, though recording it from Guatemala, but in Bentham and Hooker (Genera Plantarum **3**: 86. 1880) the two supposed species are regarded as one, and its range extended to Santo Domingo.

The range is now extended to Jamaica, where the plant was found by us in the Healthshire Hills, an exceedingly dry region at about 100 meters elevation, south of Spanish Town (*Britton & Harris 10522; Britton 3062*); here it is a woody vine 8 m. long, climbing to the tops of low trees; its reddish fleshy fruits are 3-grooved, borne in short terminal racemes. The Mexican and Central American plant seems to me to be specifically identical with that of the West Indies, as maintained by Bentham and also by Heimerl in "Die natürlichen Pflanzenfamilien."

10. UNDESCRIBED SPECIES FROM JAMAICA

Dorstenia jamaicensis Britton, sp. nov.

Rootstock erect, about 2 cm. long, 5 mm. thick, simple or branched, scarred by leaf-bases. Leaves 5–13; petioles flat, densely short-pubescent, 2–11 cm. long, about 1.5 mm. wide, erect or ascending, mostly longer than the blades; blades ovate to ovate-orbicular, rather firm in texture, 3–4.5 cm. long, 1.5–3.5 cm. wide, peltate below the middle, repand-dentate or nearly entire, papillose-scabrous above, short-pubescent beneath, especially on the 7–9 veins, which are slightly elevated and rather prominent; scape pubescent, about 2 cm. long, much shorter than the peti-

oles; receptacle peltate, purplish, puberulent, 8–10 mm. broad, saucer-shaped, its margin with about 20 triangular-subulate teeth 0.5 mm. long; flowers dark purple.

On vertical limestone cliffs, Somerset, Parish of Manchester, Jamaica, Sept. 22, 1908 (*Britton 3737*, type; *Harris & Britton 10607*). An interesting addition to the West Indian peltate-leaved Dorstenias, three being known from Cuba and one from Santo Domingo.

Trichilia Harrisii sp. nov.

A tree about 7 m. high, the twigs and leaves glabrous. Leaves 2–3 dm. long; petiole 1.5–2.5 cm. long; leaflets 5–9, flat, thin, oblong-lanceolate to ovate-elliptic, faintly pinnately veined with about 15 veins on each side of the midrib, narrowed or rounded and somewhat oblique at the base, rather long-acuminate at the apex, the larger ones 10–16 cm. long, 4–7.5 cm. wide; petioles 5–8 mm. long; fruiting panicles 15 cm. long or less, its branches finely appressed-pubescent; fruiting pedicels stout, 2–3 mm. long; capsule globose to oval, 1–2.5 cm. long, blunt or pointed, rugose, densely velutinous, tardily dehiscent.

In woods near summit of Dolphin Head Mountain, Hanover, Jamaica, March 18, 1908 (*Britton 2263*, type; *2269; Harris 10282, 10286*).

11. ADDITIONS TO THE LIST OF JAMAICA SEDGES

In 1907 I contributed an enumeration of the sedges of Jamaica to the Bulletin of the Jamaica Department of Agriculture (**5**: Supplement 1). Further exploration of that island in the autumn of 1907 and in the spring and autumn of 1908 has disclosed the occurrence of some additional species and the habitat of others which were recorded by me from the statements of other botanists.

KYLLINGA INTERMEDIA R. Br. Prodr. 219. 1810.

Pasture, Cornwall near Lacovia (*Britton 1499*). Distribution: Cuba; Australia.

KYLLINGA PERUVIANA Lam. Encyl. **3**: 366. 1789.

Not uncommon in swamps along the coasts.

CYPERUS HUMILIS Kunth, Enum. **2**: 23. 1837.

East of Port Antonio (*Wight 54*); rocky thicket, Salem (*Britton 2542*); edge of water-hole, Lucea (*Britton 2906*). Distribution: Cuba; Martinique; Central America.

CYPERUS BROMOIDES Humb.; Link, Jahrb. **3**: 85. 1820.

Marsh west of Black River (*Britton 1353*). Distribution: Cuba; Haiti; California to Mexico and Paraguay.

CYPERUS OXYLEPIS Nees; Steud. Syn. Pl. Cyp. 25. 1855.

Ditches near Salt Ponds, south of Spanish Town (*Britton 3032*). Previously collected in Jamaica only by Alexander. Distribution: northern South America.

CYPERUS ESCULENTUS L. Sp. Pl. 45. 1753.

Ditch near Flat Bridge, Rio Cobre (*Britton 3092*). West Indian distribution: Bermuda; Cuba; Martinique; Guadeloupe.

CYPERUS DIGITATUS Roxb. Hort. Bengal. 81. 1813.

Border of Black River, Lacovia (*Britton 1482*). Distribution: tropical and subtropical regions of the Old World and the New.

CYPERUS ANCEPS Liebm. Mex. Halvgr. 25. 1850.

In my paper in the Jamaica Bulletin, I followed Mr. C. B. Clarke, in Urban, Symb. Ant. **2**: 44, in recording the continental North American *Cyperus tetragonus* Ell. from Jamaica, and in referring *C. anceps* to it as a synonym, but abundant material now convinces me that the species are distinct. This sedge is plentiful on grassy hillsides and banks in the parish of Manchester (*Britton 1024, 3161*); also at Woodstock near Newmarket, in Westmoreland (*Britton 1567*). Distribution: Cuba.

CYPERUS GRANULARIS (Desf.) Britton, Bull. Jam. Dept. Agric. **5**: Suppl. 1, 9. 1907.

Dry soil, Longacre Point (*Britton 1383*). Distribution: Haiti to St. Croix.

ELEOCHARIS CAPILLACEA Kunth, Enum. **2**: 137. 1837.

In mud, marsh west of Black River (*Britton 1354*). Distribution: southern United States; Cuba; South America.

FIMBRISTYLIS AUTUMNALIS (L.) R. & S. Syst. **2**: 97. 1817.

Border of pond, Cornwall, Lacovia (*Britton 1493*). Distribution: United States; Cuba.

RYNCHOSPORA JUBATA Liebm. Vidensk. Selsk. Skr. V. **2**: 254. 1851.

Marsh west of Black River (*Britton 1356*); border of Great Morass, Negril (*Britton 2116*). Distribution: Bahamas; Cuba; Mexico to Paraguay.

An analogy between the development of the plates of crinoids and the leaves of Sassafras

EDWIN W. HUMPHREYS

It is a fact, well known to paleontologists, that the calcareous plates in the arms of crinoids are arranged in a single row in certain species, as in the Pisocrinidae and other members of the order Larviformia, or in a double row, as in *Encrinus liliiformis* and others. The biserial forms are uniserial at the lower end and here the plates are quadrangular in shape. These latter grade into wedge-shaped plates, which are next followed by biserially arranged and more or less pentagonal-shaped ones.

It was pointed out not long ago, by Dr. A. W. Grabau,* that in a number of forms, in following on toward the tips, the same series of changes is repeated, but in reversed order, so that the uniserial quadrangular plates are again found at the upper ends. There is then, starting from the base and working upward, or from the tip and proceeding downward, a change in the plates from a uniserial to a biserial arrangement and from a quadrangular, more or less regular outline, to one that is irregularly pentagonal. In other words the plates of simplest form and arrangement are at the two extremities and the more complex ones are between them. FIGURES 1a and 1b are reproductions of two of Dr. Grabau's figures illustrating these features.

From the arm plates of crinoids to the leaves of *Sassafras* may seem like a far call, but it is an interesting fact that in the leaf arrangement in many of the branchlets of a season's growth, in suckers, and in seedlings of *Sassafras*, the arrangement of the plates in the biserial crinoid arm is at once suggested. Examination of a large number of specimens collected in Bronx Park has shown none but entire leaves at the bases of all of them, while above these are either or both the bilobed and trilobed ones. The order in which these latter two forms appear is not constant, however. Sometimes the bilobed ones are below the trilobed and vice

* Amer. Jour. Sci. 16 : 289–300. *f.* 1–11. 1903.

versa. Above these there are again entire leaves. It is not to be understood, however, that this arrangement holds good in all specimens, for while it seems to be a fact that all of them have entire leaves below, with lobed ones following, it is not invariably the

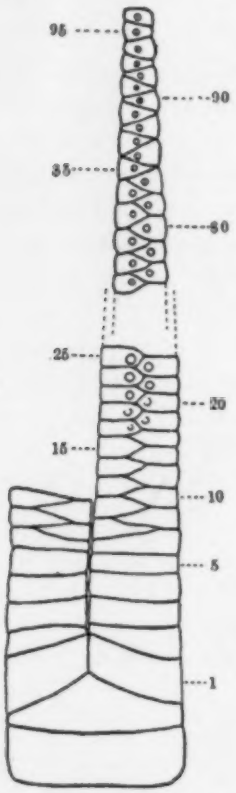

FIG. 1a. *Encrinus lilliformis*. Diagram of arms, showing arrangement and shape of plates. Reproduction of Grabau's fig. 1a.

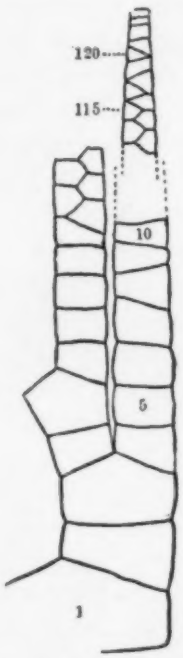

FIG. 1b. *Platycrinus hemisphericus*. Diagram of part of arm group, showing similar conditions. Reproduction of Grabau's fig. 7.

The numbers on the figures represent the serial numbering of the plates, counted from the basal one upward.

case that there are nothing but entire leaves above. A number of specimens were found in which there were no entire leaves at the top, and others on which the entire and lobed ones were mixed. Examples of two branchlets with the leaf forms and arrangement above described are shown in FIGURES 2a and 2b.

The opening bud in early spring forecasts the subsequent arrangement of the leaves on the stems. The outer ones are entire, while the inner ones are lobed. The upper zone of leaves cannot, however, be seen, as the buds are not yet sufficiently opened, but as the bud expands and the new branch grows the entire leaves remain at intervals along the lower part of the branch, while the lobed ones are carried higher up, and finally the second series of entire leaves unfolds at the top. As, therefore, in the crinoid arm, the simplest forms of structure are found at the base and tip, with the more complex ones between them.

It seems probable that this arrangement of the leaves in *Sassafras* has, like the arrangement of the plates in the biserial crinoid arm, some phylogenetic significance. In regard to the crinoids it is believed that the grouping of the plates epitomizes the life-history or development of the organisms to which they belong, and that this history, having its climax in the central part of the arm, may be read either upward from the base or downward from the tip. It is inferred, therefore, that the earliest crinoids of any genetic series had simple uniserial arms with quadrangular plates, and that gradually the plates became biserial in arrangement and more complex in form. There are also other facts which indicate that this is the correct interpretation.

In like manner the leaf arrangement described seems to indicate that it also summarizes the development of the *Sassafras* branch and its leaves, and that this story may be similarly read, either upward or downward, although the change from entire to lobed leaves is more abrupt and less gradual than is the transition from quadrangular to pentagonal plates in the crinoid arm. If this analogy holds true, it leads to the inference, therefore, that the ancestral type of *Sassafras* had entire leaves and that these are the primitive leaf forms, while the lobed ones are a later development.

Since writing the above my attention has been called to R. T. Jackson's observations on *Sassafras*, in his "Localized Stages in Development in Plants and Animals." * The inference above expressed, however, in regard to the ancestral type of *Sassafras* leaf,

* Mem. Boston Soc. Nat. Hist. 5: 89–153. *pl. 16–25.* 1899.

FIGS. 2a, 2b. Branchlets of *Sassafras Sassafras* (L.) Karst., showing arrangement of entire and lobed leaves. Collected in Bronx Park, New York, N. Y., October, 1908.

is different from his, which is that the lobed forms are the primitive or ancestral type, and is, I think, more in accord with the recapitulation theory. Indeed, Jackson recognizes the difficulties of his interpretation and that under it *Sassafras* becomes an exception to the usual condition. He says:* "The fact that seedlings start with entire leaves and later acquire lobed leaves like the earliest fossil representatives seems difficult to harmonize with the usual condition, where the first leaves are like the primitive or ancient types, and later leaves are different, being more specialized, as in *Liriodendron*, white ash, and *Platanus*." Now while it is true that what are generally recognized as the earliest ancestral forms of *Sassafras* leaves are lobed, and that apparently there are no entire fossil *Sassafras* leaves known, as remarked by E. W. Berry in his "Notes on Sassafras," † nevertheless, as the latter author well says, there are several fossil leaves with entire margins, which are referred to other genera, that might with equal propriety be referred to *Sassafras*, such for example as *Cinnamomum Heerii* Lesq.,‡ and anyone familiar with figures of fossil leaves may readily recall other species in this and other genera which compare very closely with certain of the entire leaf forms in the living *Sassafras*. It may also be pertinent to remark that the determination of genera in fossil botany, based upon leaves only, has not attained to such precision that all leaves can with certainty be referred to their correct genera. Further than this, it may be recalled that even the correctness of the reference of many fossil lobed leaves to the genus *Sassafras* has been questioned or criticized by competent authorities. Thus the fact that lobed leaves were actually the earliest ancestral forms is by no means definitely established. The entire forms may yet be found, either as new discoveries or as species incorrectly referred to other genera. Jackson's interpretation, therefore, which places the lobed leaves as the earliest forms, may not be in accordance with the actual facts, but opposed to them, and since it necessitates an apparent exception to the usual condition, requiring a devious explanation, the better course would seem to be to regard the

* *Loc. cit.* 108.

† Bot. Gaz. 34: 426–450. *pl. 18+f. 1–4.* 1902.

‡ *Loc. cit.* 433.

entire leaf as the earliest ancestral form, the fossil representatives of which are at present either undiscovered or perhaps incorrectly referred to certain other lauraceous genera.

Finally, it appears logical to infer in regard to reversionary leaf forms, which are really not reversions but forms which have not developed beyond the ancestral condition, that if they do occur they should appear when the growth of the tree is least vigorous, and that the leaves of full development should appear when the tree is in its period of maximum growth. Growth is least vigorous in early spring, when the tree is awakening from its dormant condition, and in autumn when it is preparing for it. The leaves which appear at these periods are the simplest in form. Summer is the time of maximum vigor of growth and the leaves which appear at that period are the most highly specialized or differentiated. Further than this, in any given growing season the bud for the next season is already being formed. The outer leaves of the bud, which become the lower leaves of the next season's branch, are the first formed and are therefore formed during the early part of the growing season, while the innermost ones, which subsequently become the uppermost ones of the future branch, are formed late in the growing season. These are the simplest in form. The intermediate zone of bud leaves, which are destined to occupy the median part of the branch, are formed during the height of the growing season, when conditions are most favorable for full development. These are the lobed ones.

From every point of view in which actual facts are in our possession it therefore seems reasonable to regard the entire leaves as the type of the ancestral form, and the arrangement of the several leaf forms on the branch as representing the development of the organism as a whole from infancy to maturity and back again to second childhood or old age.

I desire to acknowledge the kindly assistance of Professor A. W. Grabau, of Columbia University, and of Dr. Arthur Hollick, of the New York Botanical Garden, in the preparation of this paper.

North Dakota slime-moulds

FRED J. SEAVER

During the fall of 1907 and spring of 1908, in connection with the study of the fungus flora of North Dakota, a number of species of slime-moulds were collected, and since there is no available literature on this particular phase of the cryptogamic flora of the state, it is thought advisable to publish the list at this time. The work above mentioned was carried on in connection with the North Dakota Agricultural College and specimens of the species reported on here are preserved in the herbarium of that institution, to which I am indebted for the privilege of carrying on the work.

With few exceptions, such as that of the disease known as the club-rot of cabbage, the slime-moulds are not known to be of any economic importance, and since they are usually small and grow in out of the way places little attention is given to them. But notwithstanding their failure to appeal to those interested in the commercial phases of the botanical science only, their strange life-history, delicate structure, and uncertain relationship with other groups of plants and animals never fail to arouse the interest of the student in the class-room and it was for this reason that most of the species reported here were first collected.

In preparing this list acknowledgments are due to Professor T. H. Macbride, of Iowa, for identification or confirmation of the identification of the species named below.

PHYSARACEAE

CIENKOWSKIA RETICULATA (Albert. & Schwein.) Rost.

This is the only species of the genus and according to Professor Macbride, in the North American Slime-moulds, is very rare. The species was at first mistaken for an immature plasmodium, which it very closely resembles.

DIDERMA CRUSTACEUM Peck.

Common and rather attractive. The species has been collected several times in North Dakota, usually on the stems of herbaceous

plants and often some distance above ground, an adaptation for spore distribution.

DIDYMIUM SQUAMULOSUM (Albert. & Schwein.) Fries.

On leaves and decaying materials of various kinds. A common species.

FULIGO OVATA (Schaeff.) Macbr.

This is a common species and one which often attains considerable size. One specimen collected on a rotten log in North Dakota was from six to eight inches in diameter and smaller specimens were found to be very common.

PHYSARUM CONTEXTUM Pers.

Several collections were made on decaying materials of various kinds in woods near Fargo.

TILMADOCHE VIRIDIS (Bull.) Sacc.

Plants collected on rotten wood. The species is not uncommon and has a wide distribution.

STEMONITACEAE

STEMONITIS MAXIMA Schwein.

Numerous specimens were collected on bark and wood of *Tilia americana*, for which substratum it shows a decided preference. Widely distributed.

STEMONITIS SMITHII Macbr.

The specimens, collected in similar localities to the preceding, were mostly larger and easily distinguished from that species by the color of the spore mass, which is ferruginous instead of purplish black. Rather common.

CRIBRARIACEAE

DICTYDIAETHALIUM PLUMBEUM (Schum.) Rost.

Several collections on decaying wood. The plants are depressed and spread out, becoming 1–2 cm. in diameter and recognized by these characters and the ochraceous color. The one species known to North America has a wide distribution.

DICTYDIUM CANCELLATUM (Batsch) Macbr.

One of the most variable species of the group, the plants being either long- or short-stemmed and very variable in color.

TUBIFERA FERRUGINOSA (Batsch) Macbr.

Collected on rotten wood and distinct in the tubiferous sporangia, which persist long after the shedding of the spores. The sporangia occur in dense masses.

LYCOGALACEAE

LYCOGALA EPIDENDRUM (Bux.) Fries.

The young phases of this plant are often met with in woods, and the bright red color of the plasmodium of the forming sporangia make them rather conspicuous objects. At maturity, however, the sporangia lose their bright color and become more nearly the color of the substratum on which they occur. Said to be the most common slime-mould in the world.

TRICHIACEAE

ARCYRIA INCARNATA Pers.

The plants of this species are often found closely crowded on rotten stumps, sometimes covering an area of several inches. At maturity the delicate threads of the capillitium push out so that the entire group of plants resembles rich flesh-colored velvet.

ARCYRIA DENUDATA (L.) Sheld.

Plants resembling those of the preceding species but distinguished by the dull reddish brown color. The species was found to be common but did not occur in such abundance as the preceding.

HEMITRICHIA CLAVATA (Pers.) Rost.

Common on rotten wood and distinguished by the stipitate, cup-shaped remains of the sporangia containing the golden yellow capillitium. The twisted rope-like appearance, which is one of the characteristics of the genus, is revealed only by microscopic examination.

HEMITRICHIA VESPARIA (Batsch) Macbr.

At once recognized in the field as distinct from the preceding by the dark reddish purple color of the sporangia. Several collections made on rotten wood. The species is common.

TRICHIA PERSIMILIS Karst.

Rather common and widely distributed in North America.

OLIGONEMA FLAVIDUM (Peck) Massee.

The sporangia of this species grow closely crowded together in little masses and the species is quite distinct in this character and the bright yellow color of the sporangia.

NEW YORK BOTANICAL GARDEN.

Two imperfectly known species of Crataegus

FRANCIS RAMALEY AND G. S. DODDS

So much misunderstanding exists in regard to certain *Crataegi* of Colorado that further notes intended to clear up the difficulties may not be amiss. Dr. Rydberg, in his excellent Flora* did not extricate the species from the perplexity of much description. Two of the best-marked species, *C. occidentalis* and *C. coloradensis*, although recognized by him as distinct, cannot be separated by the use of his key.

These two species were studied by Professor Cockerell † and clearly separated. Unfortunately the names given by Professor Cockerell are, by further study, found to be either incorrect or else not the earliest. The present writers, after considerable field study, are in a position to add certain characters not mentioned by him and thus help to straighten out difficulties. Also, through the courtesy of Dr. N. L. Britton, who has kindly reëxamined his type of *Crataegus occidentalis*, some characters may now be stated in regard to the species which were not printed in the original description (length of petiole, pubescence of twigs, etc.).

The synonymy of the two species under consideration is as follows:

CRATAEGUS OCCIDENTALIS Britton, Bull. N. Y. Bot. Garden **1**: 448. Mr 1898.

C. Colorado Ashe, N. C. Agric. Exp. Sta. Bull. 175: 110–113. Au 1900.

C. macracantha occidentalis Eggleston, Rhodora **10**: 82. 1908. In part.

CRATAEGUS COLORADENSIS A. Nelson, Proc. Biol. Soc. Wash. **17**: 175. D 1904.

C. occidentalis Cockerell, Univ. of Colo. Studies **5**: 42. 1907. Not *C. occidentalis* Britt.

* Rydberg, P. A. Flora of Colorado, Colo. Agric. Coll. Exp. Sta. Bull. **100**: 192. 1906.

† Cockerell, T. D. A. Univ. of Colo. Studies **5**: 41–45. 1907.

C. macracantha occidentalis Eggleston, Rhodora **10**: 82. 1908. In part.

COMPARISON OF THE TWO SPECIES

C. occidentalis	*C. coloradensis*
FORM AND SIZE	FORM AND SIZE
Small, much-branched tree with crooked trunk and limbs, 2–6 m. high, sometimes shrub-like and dwarfed.	Spreading round-topped tree, 2–6 m. high, usually symmetrical, not crooked or much branched.
BRANCHES AND TWIGS	BRANCHES AND TWIGS
Branches gray; twigs blackish, those of the season loosely villous. Bud-scales large, persistent to flowering time, the midrib pink-purplish.	Branches gray; twigs brownish, those of the season shining chestnut-brown, glabrous. Bud-scales small, early deciduous.
LEAF-BLADES	LEAF-BLADES
Broadly obovate or oval, coarsely toothed, with a tendency to become 4 or 5-lobed.	The same.
Very rough, dark green but not bluish green nor bronze-green.	Moderately rough, dark bluish green or bronze-green.
Scatteringly pubescent above, pubescent on the veins below.	The same.
PETIOLES	PETIOLES
About $\frac{1}{6}$ or $\frac{1}{5}$ the length of the blade, pubescent.	About $\frac{1}{4}$ the length of the blade, pubescent.
INFLORESCENCE	INFLORESCENCE
Broad or flat-topped corymb; pedicels villous.	Broad or flat-topped corymb; pedicels somewhat pubescent.
FLOWERS	FLOWERS
About 16 mm. broad.	The same.
Stamens 10 or less.	The same.
Anthers white or cream-colored.	Anthers pink or rose-colored.
Calyx-tube conical, the lobes villous, with slender gland-tipped teeth.	Calyx-tubes very short conical, the lobes sometimes villous with slender gland-tipped teeth.
FRUIT	FRUIT
Bright red, soft-pulpy.	The same.
Broader than long, 10–12 mm. broad, 9–11 mm. long.	Spherical, 10 mm. in diameter.
Indented at base where attached to pedicel; the latter not club-shaped.	Not indented where attached to pedicel; the latter club-shaped.

From the above comparison it is evident that the two species are easily distinguished. The present writers cannot agree with Mr. Eggleston, who, as cited above, combines them and places this

much-lumped group as a variety under an eastern species. The Rocky Mountain species of *Crataegus* are restricted in distribution to canyon mouths and gulches of the lower foothills. They do not occur on the plains. Hence it seems best to consider them as specifically distinct from eastern species. The discontinuous distribution in itself would be almost sufficient ground for such separation, but the characters of our Colorado species are so good that they certainly deserve separate treatment.

C. occidentalis and *C. coloradensis* may be distinguished with ease in the field or the herbarium, whether flowering or fruiting specimens are examined. Indeed, with neither flowers nor fruits it is an easy matter to separate them from each other, although not so easy to distinguish *C. occidentalis* from some other closely related forms.

UNIVERSITY OF COLORADO,
BOULDER, COLO.

INDEX TO AMERICAN BOTANICAL LITERATURE

(1904–1907)

The aim of this Index is to include all current botanical literature written by Americans, published in America, or based upon American material; the word America being used in its broadest sense.

Reviews, and papers which relate exclusively to forestry, agriculture, horticulture, manufactured products of vegetable origin, or laboratory methods are not included, and no attempt is made to index the literature of bacteriology. An occasional exception is made in favor of some paper appearing in an American periodical which is devoted wholly to botany. Reprints are not mentioned unless they differ from the original in some important particular. If users of the Index will call the attention of the editor to errors or omissions, their kindness will be appreciated.

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Includes *Bowlesia pilosa longipes* Domin var. nov.

Domin, K. Zwei neue *Azorella-Arten* aus Südamerika. Repert. Nov. Spec. **4**: 296–298. 20 O 1907.

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Includes 20 new species and varieties.

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[Gibson, H. H.] American forest trees — 2. White oak, *Quercus alba* Linn. Hardwood Record **19**[7]: 13, 14. 25 Ja 1905. [Illust.]

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[**Gibson, H. H.**] American forest trees — 10. Cypress, *Taxodium distichum* (Linn.) Rich. Hardwood Record **20**[3]: 16, 18. 25 My 1905. [Illust.]

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[**Gibson, H. H.**] American forest trees — 12. White Ash, *Fraxinus americana* Linn. Hardwood Record **20**[5]: 12, 14. 25 Je 1905. [Illust.]

[**Gibson, H. H.**] American forest trees — 13. Shagbark hickory, *Hicoria ovata* (Mill.) Britton. Hardwood Record **20**[6]: 12, 13. 10 Jl 1905. [Illust.]

[**Gibson, H. H.**] American forest trees — 14. Red oak, *Quercus rubra* Linn. Hardwood Record **20**[7]: 12, 13. 25 Jl 1905. [Illust.]

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[**Gibson, H. H.**] American forest trees — 16. Black cherry, *Prunus serotina* Ehrh. Hardwood Record **20**[9]: 12, 13. 25 Au 1905. [Illust.]

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[**Gibson, H. H.**] American forest trees — [18]. Red gum, *Liquidambar Styraciflua* Linn. Hardwood Record **20**[11]: 12–15. 25 S 1905. [Illust.]

[**Gibson, H. H.**] American forest trees — 19. Cottonwood, *Populus deltoides* Marsh., *Populus monilifera* Ait. Hardwood Record **20**[12]: 10, 11. 10 O 1905. [Illust.]

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[**Gibson, H. H.**] American forest trees — 21. Red maple, *Acer rubrum* Linn. Hardwood Record **21**[2]: 10, 11. 10 N 1905. [Illust.]

[**Gibson, H. H.**] American forest trees — 22. Ironwood, *Ostrya virginica* (or *virginiana*) Willd. Hardwood Record **21**[3]: 12, 13. 25 N 1905. [Illust.]

[**Gibson, H. H.**] American forest trees — 23. Buckeye, *Aesculus octandra* Marsh., *Aesculus flava* Ait. Hardwood Record **21**[4]: 10, 11. 10 D 1905. [Illust.]

[**Gibson, H. H.**] American forest trees — 24. Black gum, *Nyssa sylvatica* Marsh. Hardwood Record **21**[5]: 12, 13. 25 D 1905. [Illust.]

[**Gibson, H. H.**] American forest trees — 25. Live Oak, *Quercus virginiana* Mill., *Quercus virens* Ait. Hardwood Record **21**[6]: 10, 11. 10 Ja 1906. [Illust.]

[**Gibson, H. H.**] American forest trees — 26. White pine, *Pinus Strobus* Linn. Hardwood Record **21**[7]: 14–16. 25 Ja 1906. [Illust.]

[**Gibson, H. H.**] American forest trees — 27. Hemlock, *Tsuga canadensis* (Linn.) Carr. Hardwood Record **21**[8]: 10, 11. 10 F 1906. [Illust.]

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Includes 12 new species of *Basidiomycetes* and *Ascomycetes*.

Rick, J. Pilze aus Rio Grande do Sul (Brazilien). Brotéria **5**: 5–53. 1906.

Includes 44 new species.

Rosenstock, E. *Filices* novae — I. Repert. Nov. Spec. **4**: 2–6. 1 My 1907; — II. **4**: 292–296. 20 O 1907.

Includes new Brazilian species in *Lindsaya*, *Dryopteris* (2) and *Elaphoglossum* (3).

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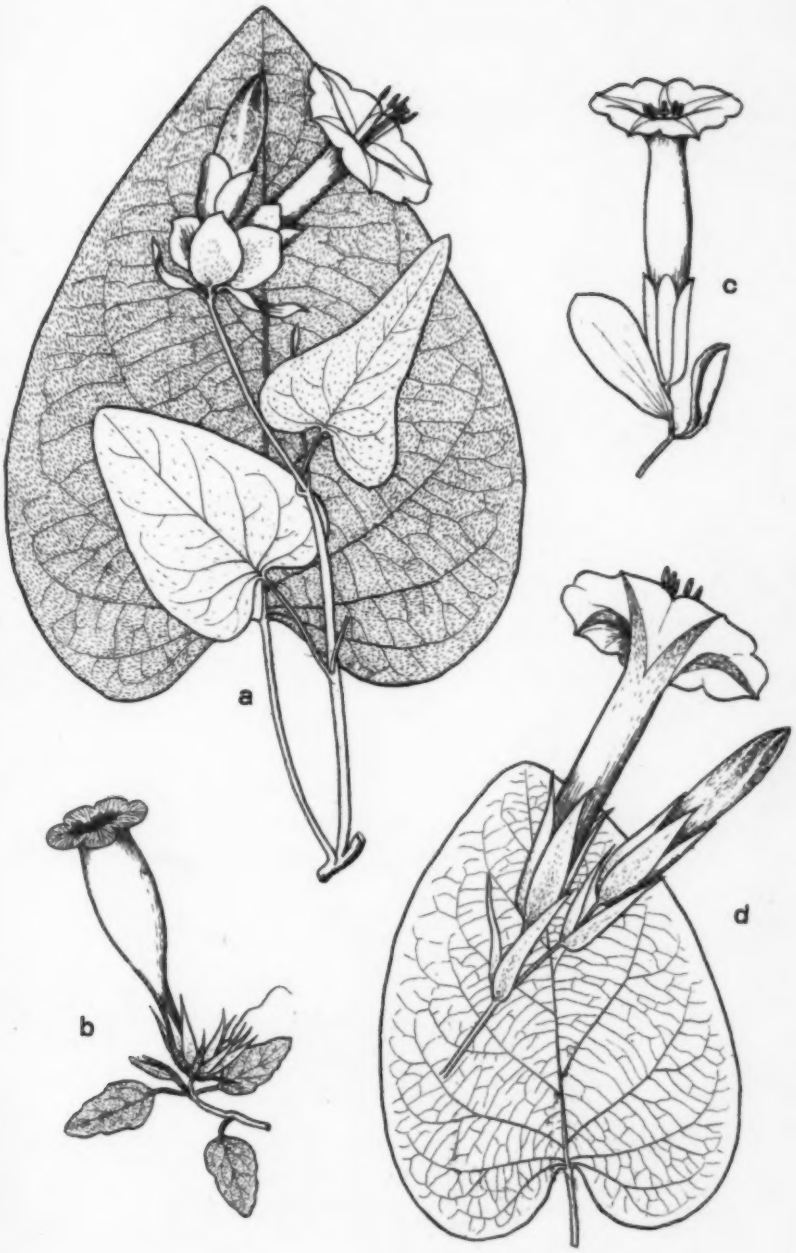

a. EXOGONIUM RUDOLPHII (Roem.& Schult) House
b. EXOGONIUM VELUTIFOLIUM House
c. EXOGONIUM RACEMOSUM (Poir) Choisy
d. EXOGONIUM WRIGHTII House

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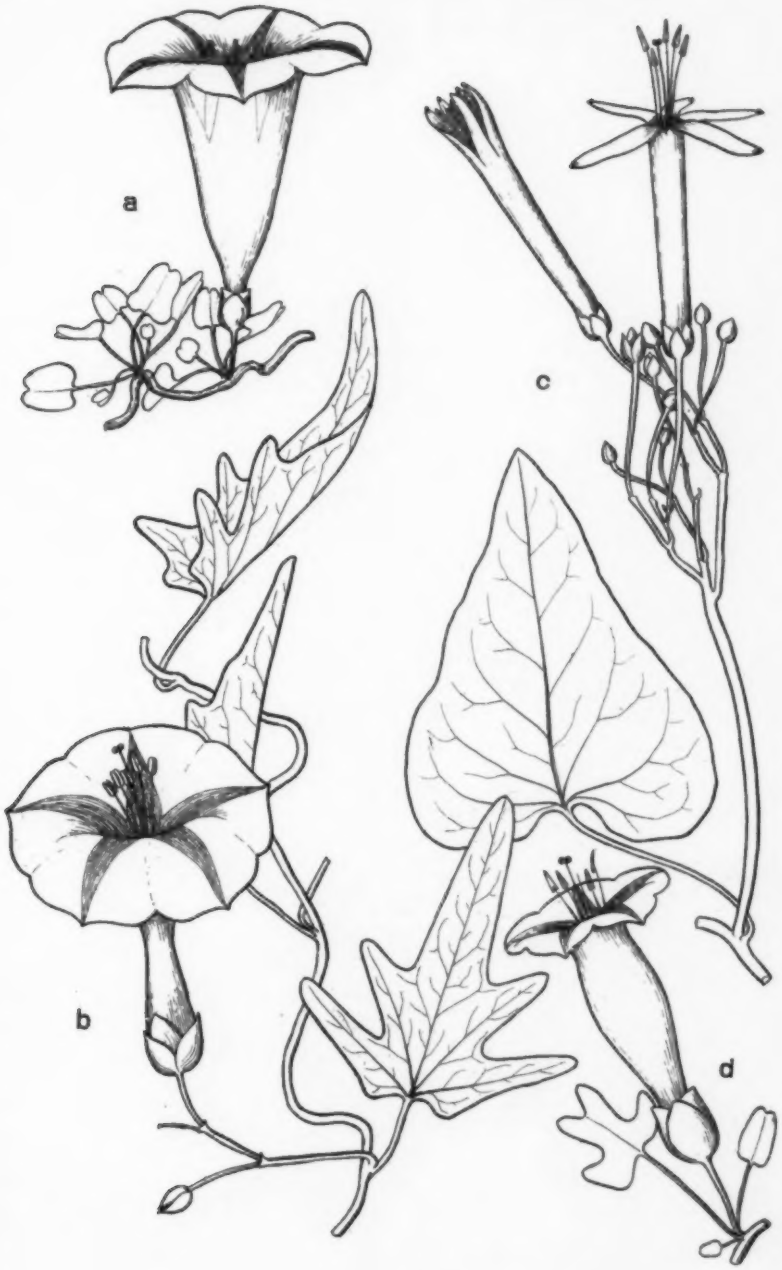

a. EXOGONIUM EGGERSII House
b. EXOGONIUM CUBENSE House
c. EXOGONIUM LUTEUM House
d. EXOGONIUM ARENARIUM Choisy

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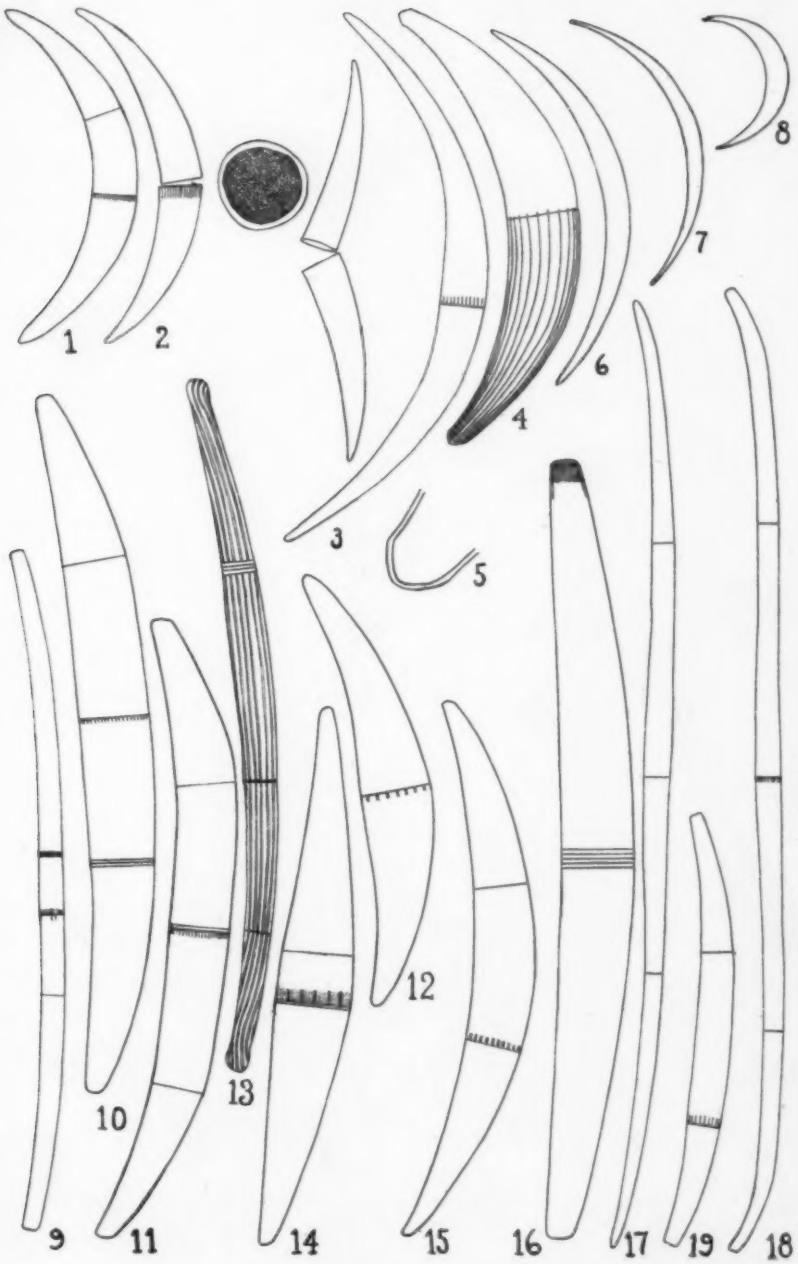

NEW ENGLAND SPECIES OF CLOSTERIUM

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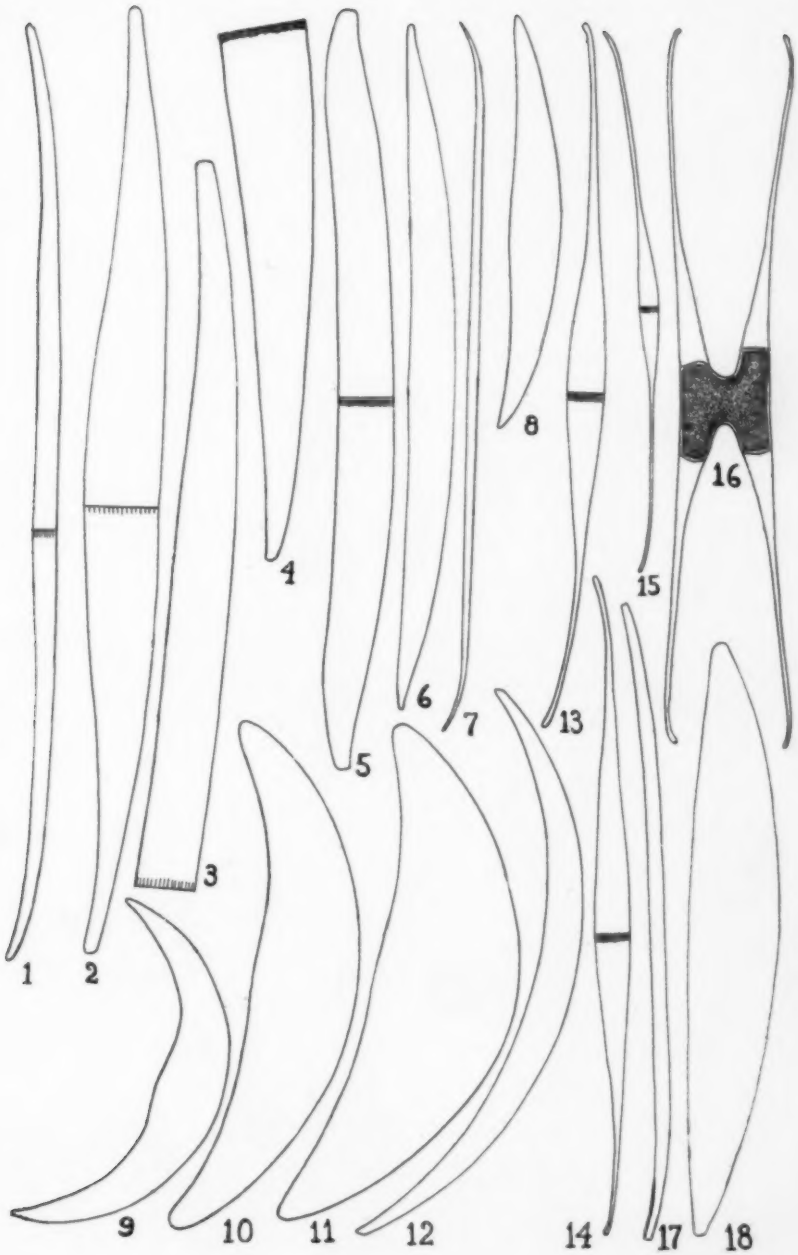

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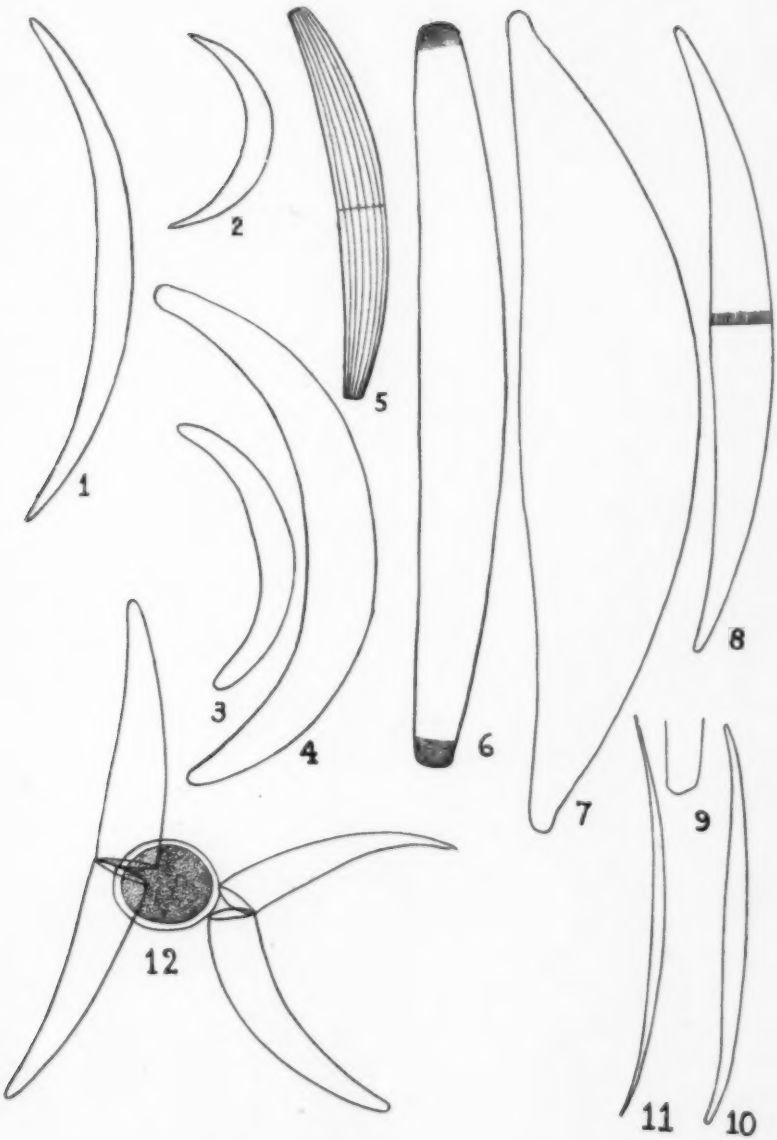

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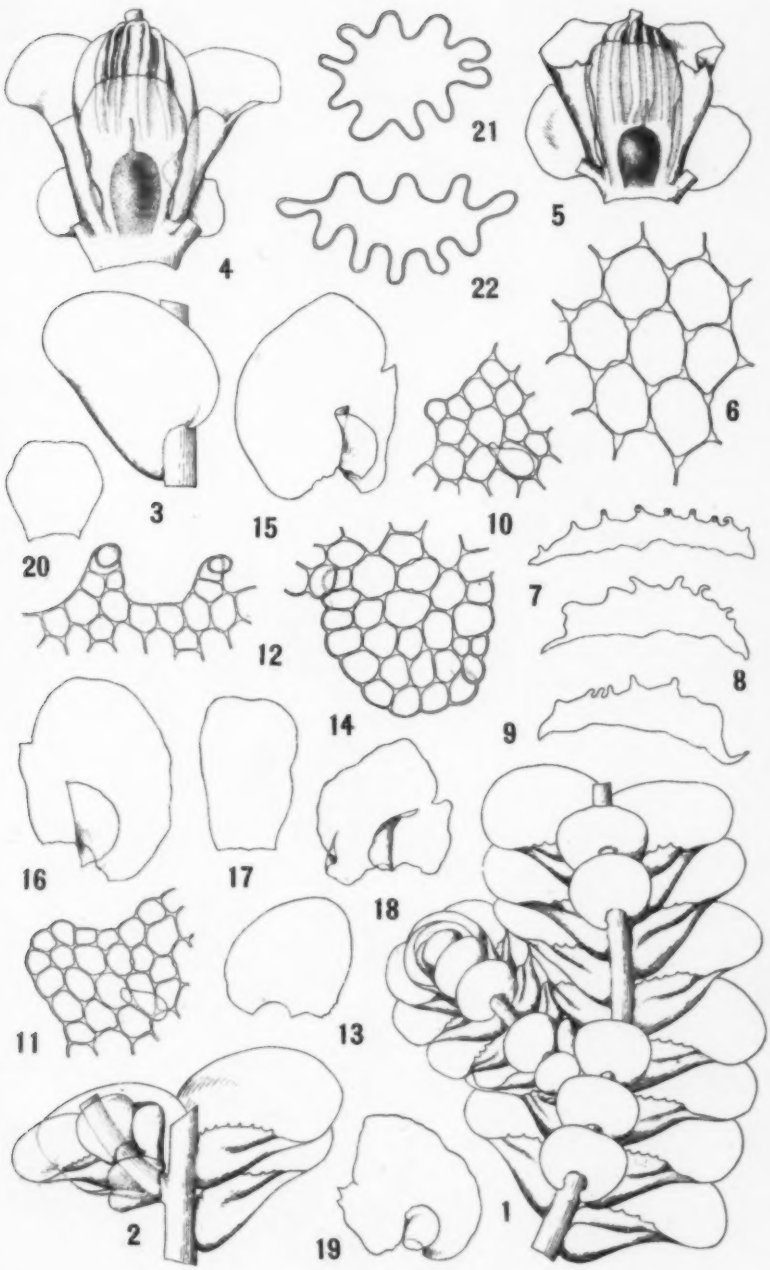
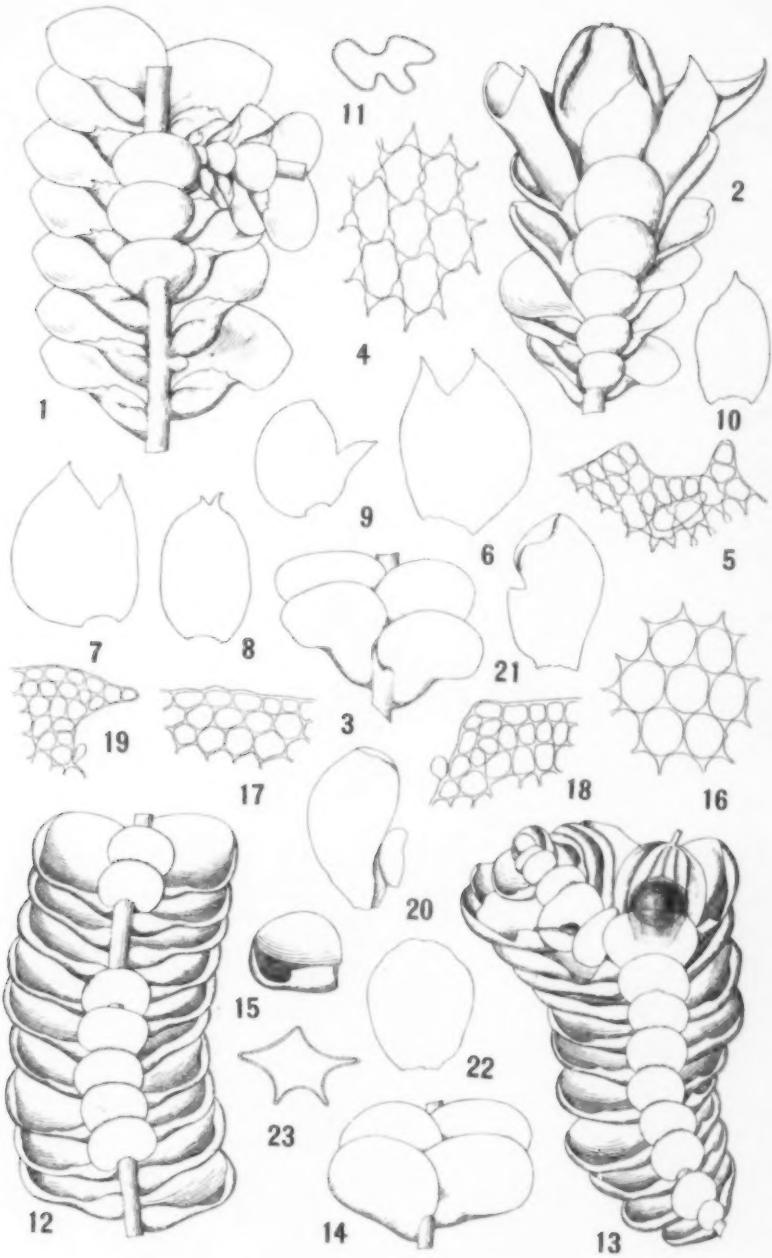


BRACHIOLEJEUNEA INSULARIS Evans.



1-11 PTYCHOCOLEUS POLYCARPUS (Nees) Trevis.
12-23 LEUCOLEJEUNEA XANTHOCARPA (Lehm. & Lindenb) Evans.

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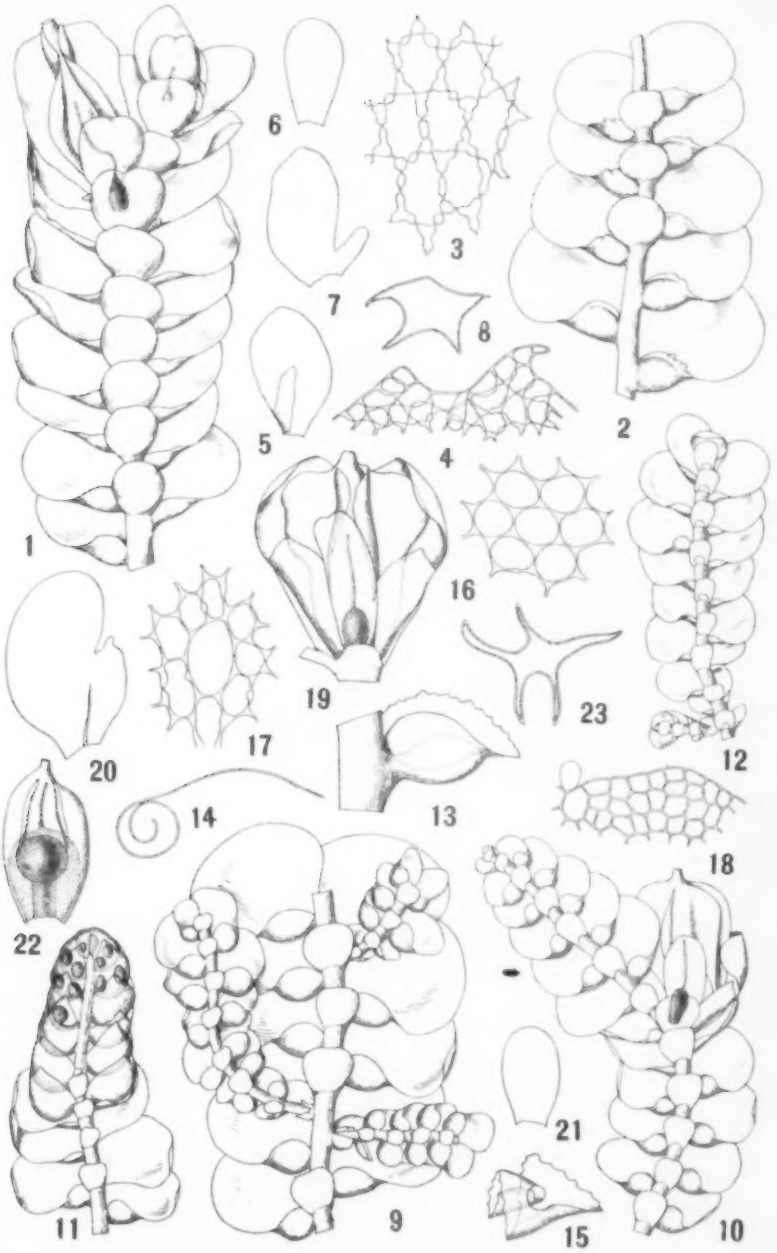

1-8 ARCHILEJEUNEA VIRIDISSIMA (Lindenb) Evans.
9-23 ANOPLOLEJEUNEA CONFERTA (Meissn) Evans.

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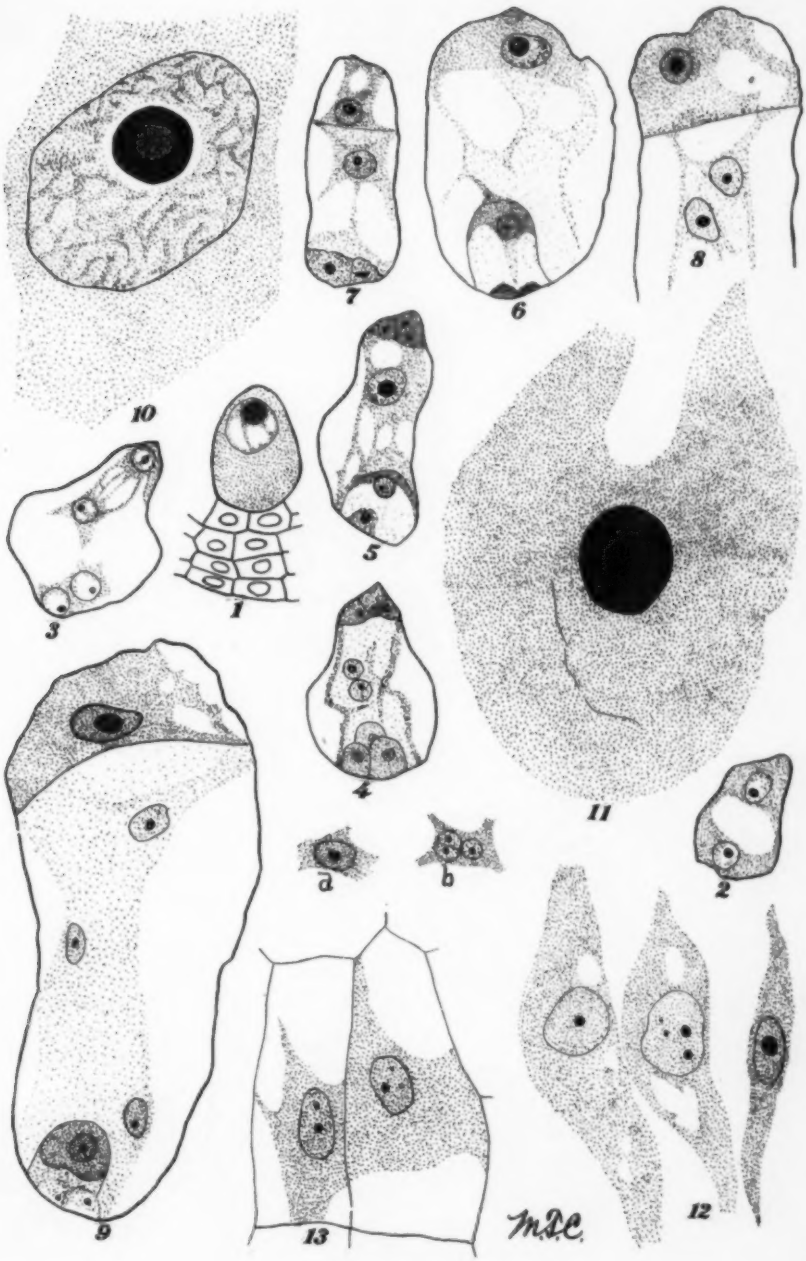
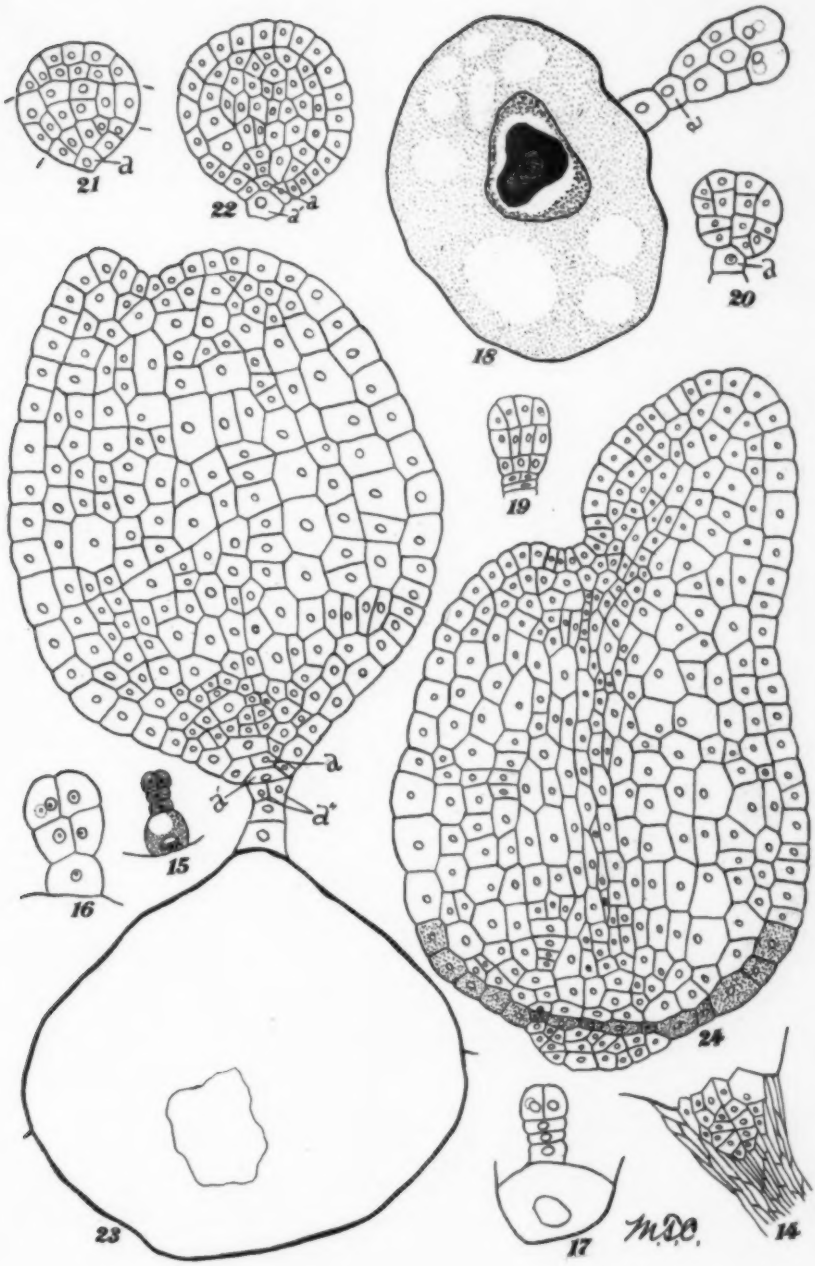


EMBRYOLOGY OF POTAMOGETON LUCENS



EMBRYOLOGY OF POTAMOGETON LUCENS

COCKAYNE, BOSTON

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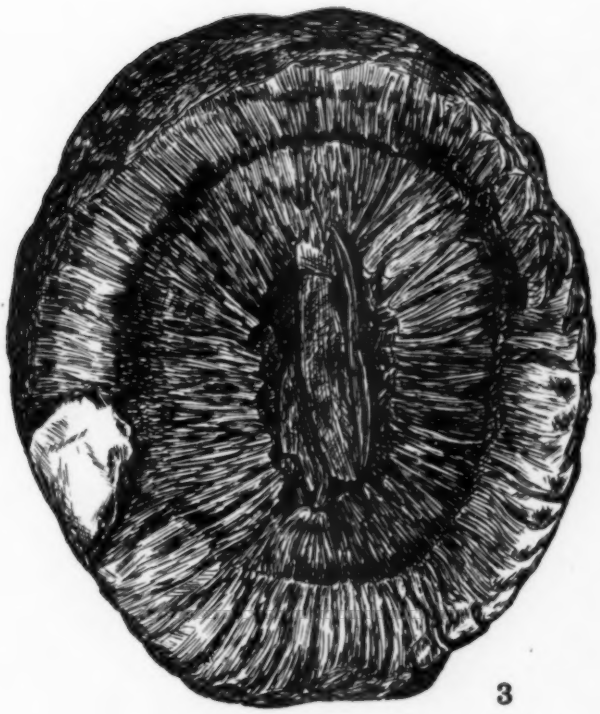
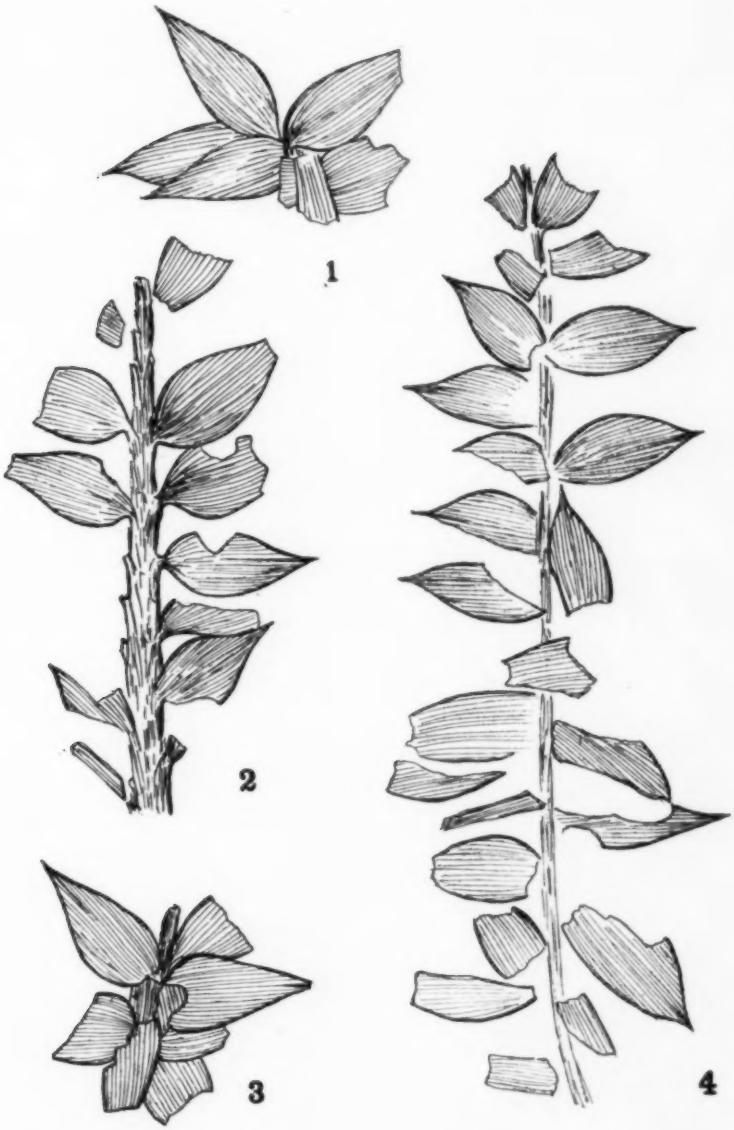
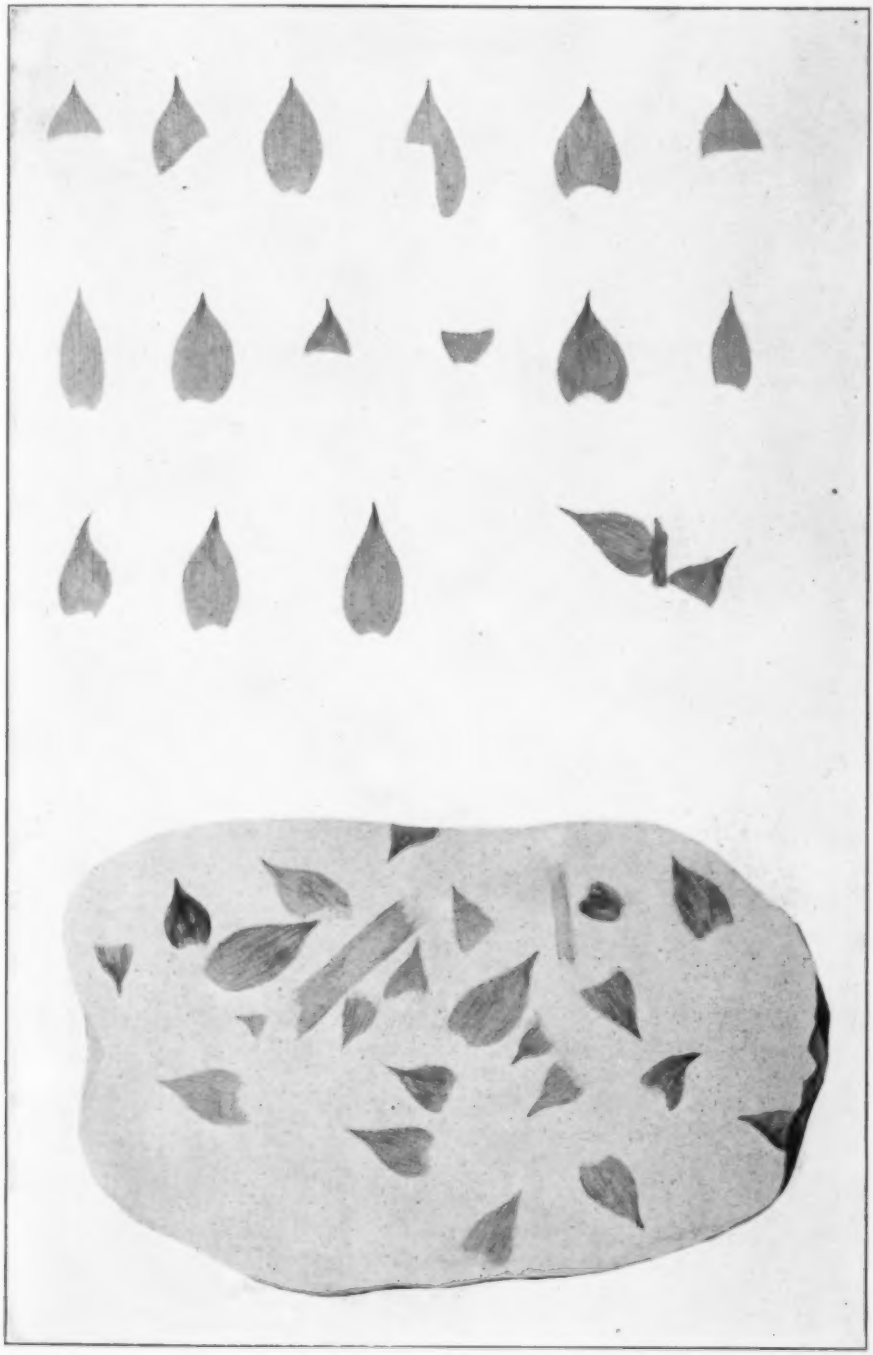


3

1. MICROZAMIA (?) DUBIA Berry
2. GYMNOSPERMOUS CONE
3. ARAUCARITES ZEILLERI Berry



ARAUCARIA BLADENENSIS Berry



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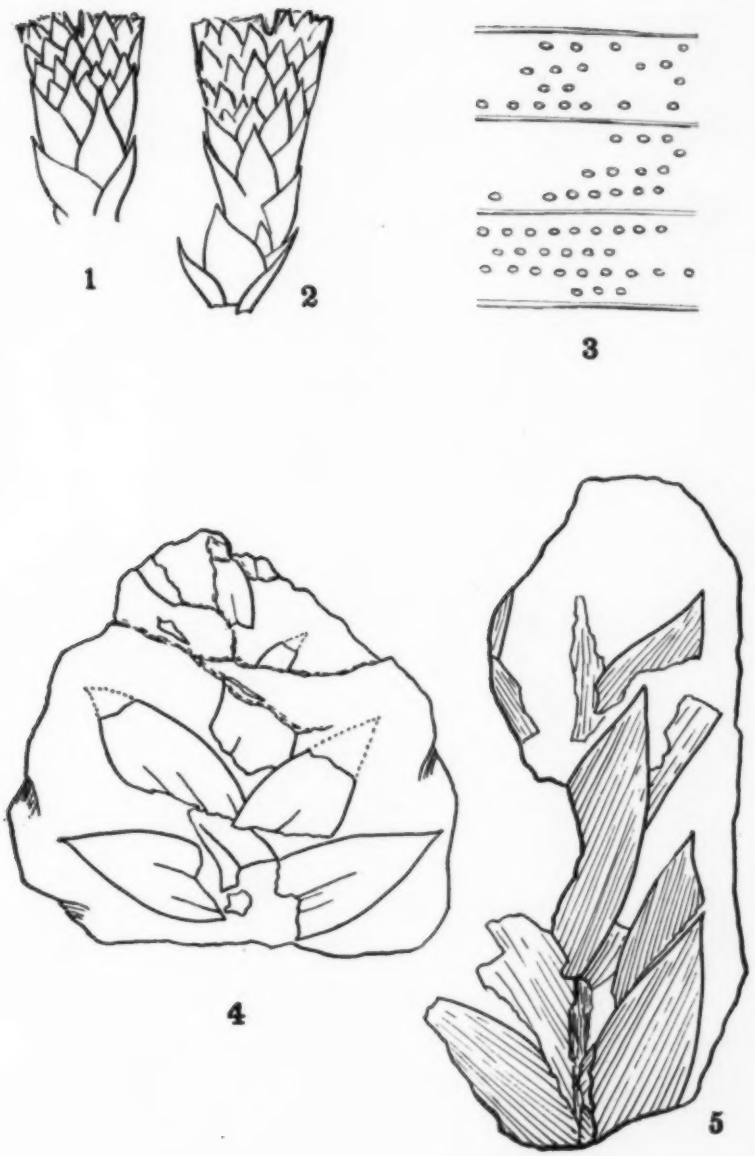

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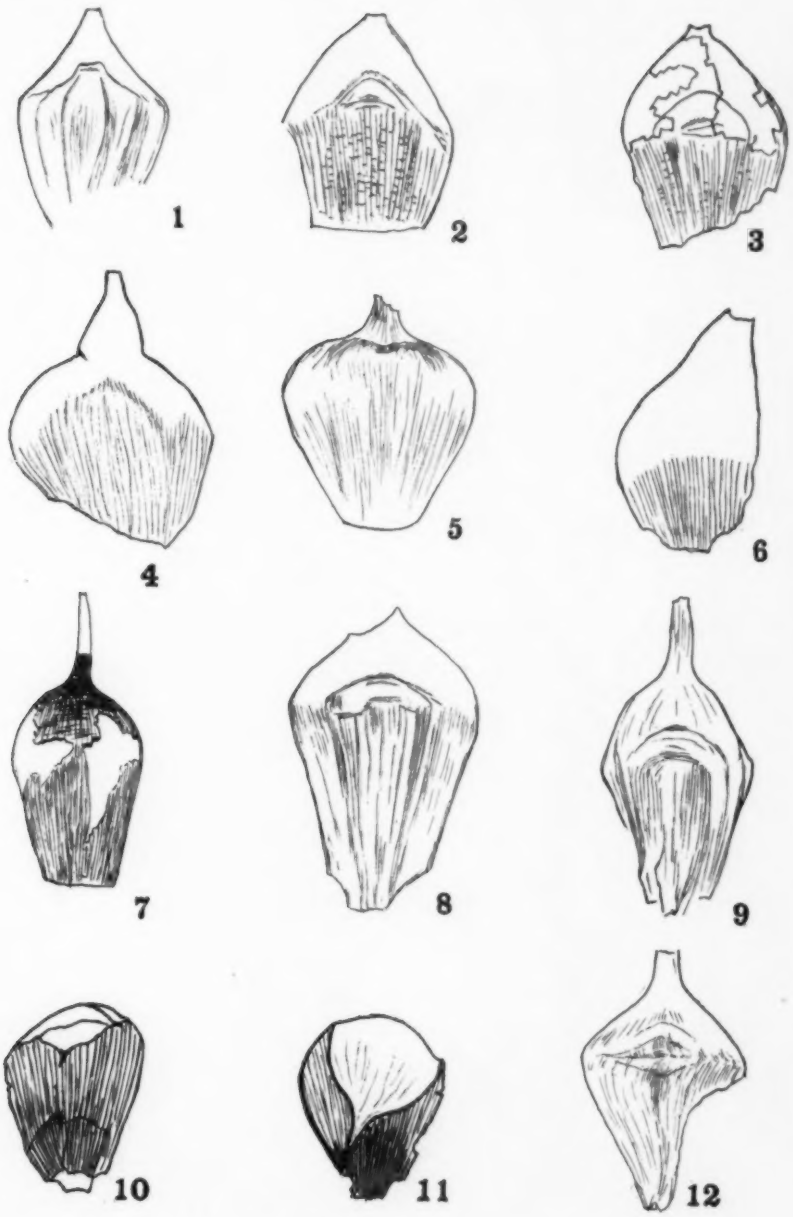
4 and 5. ARAUCARITES OVATUS Hollick

ARAUCARIA BIDWILLI Hook.



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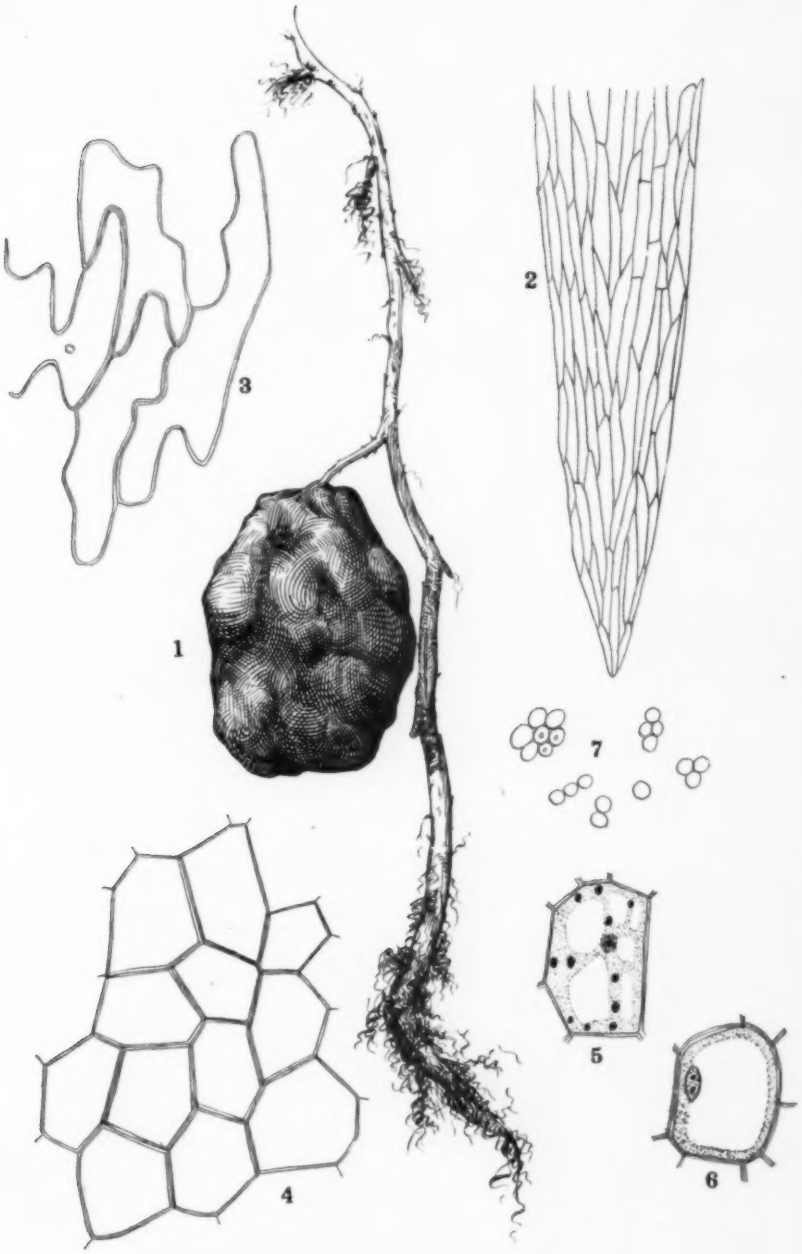

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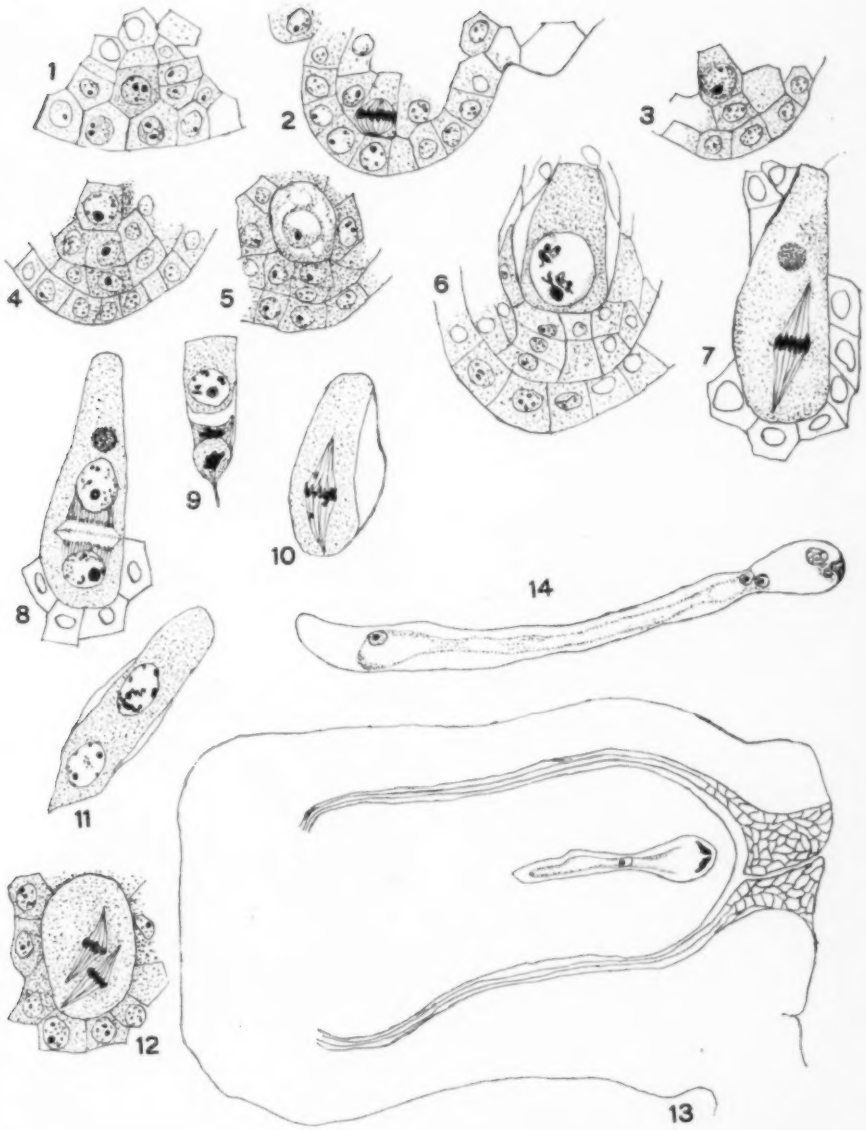

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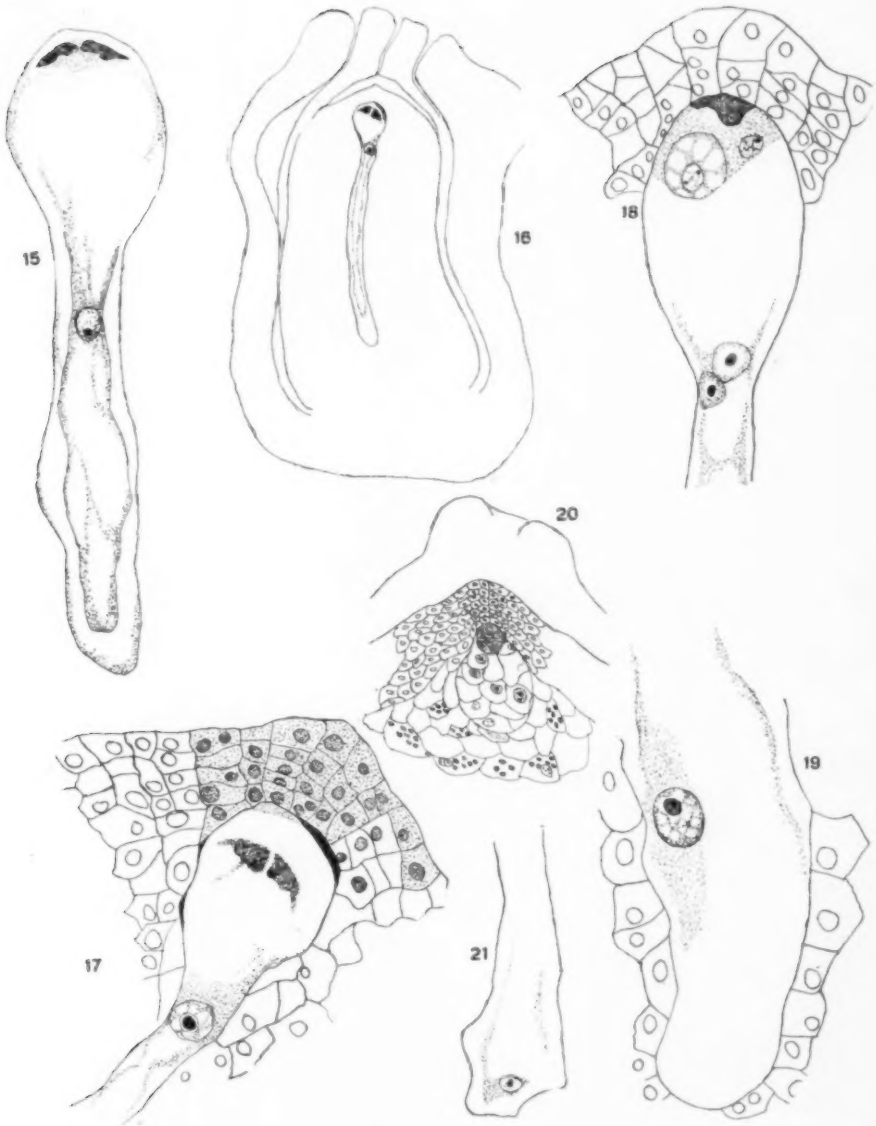

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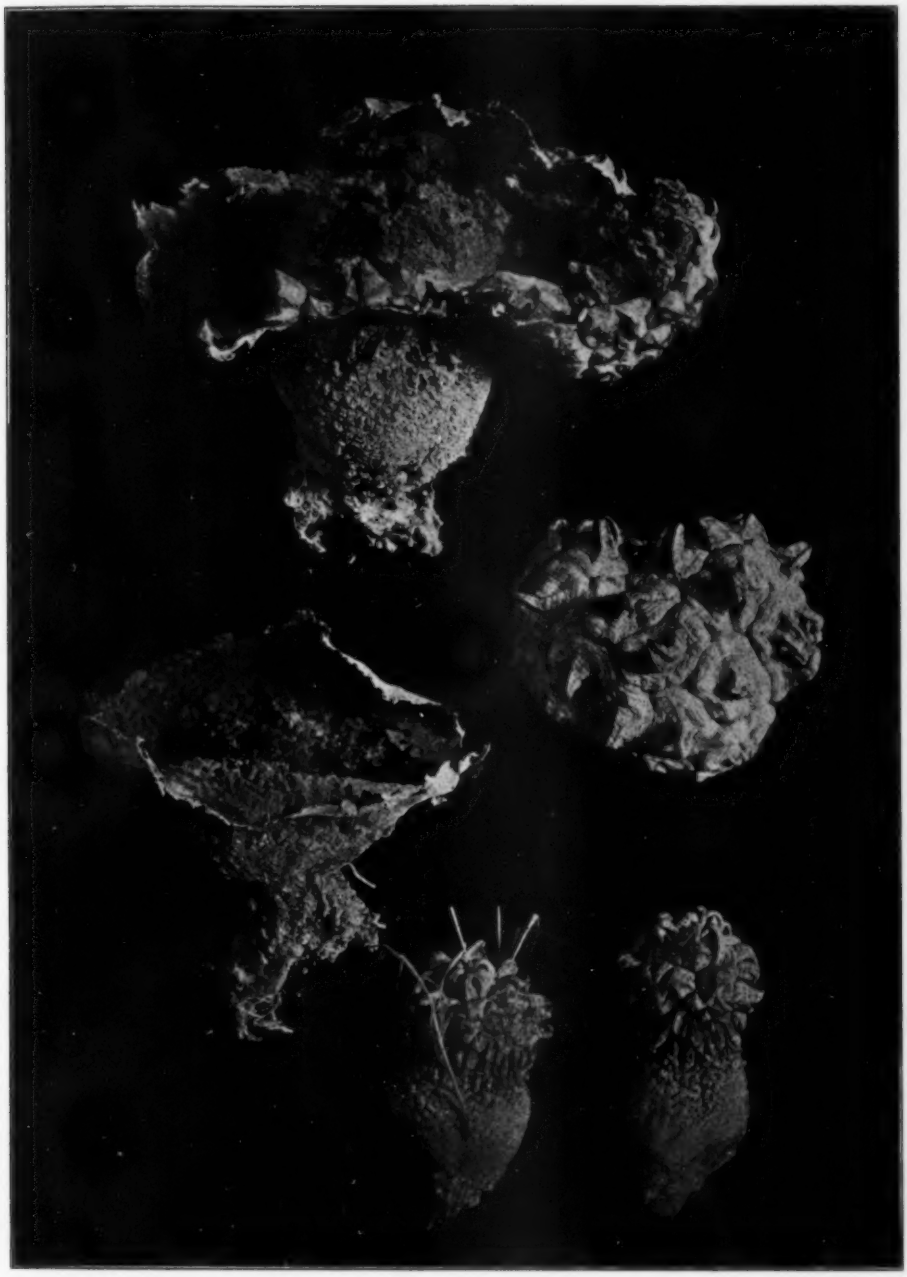
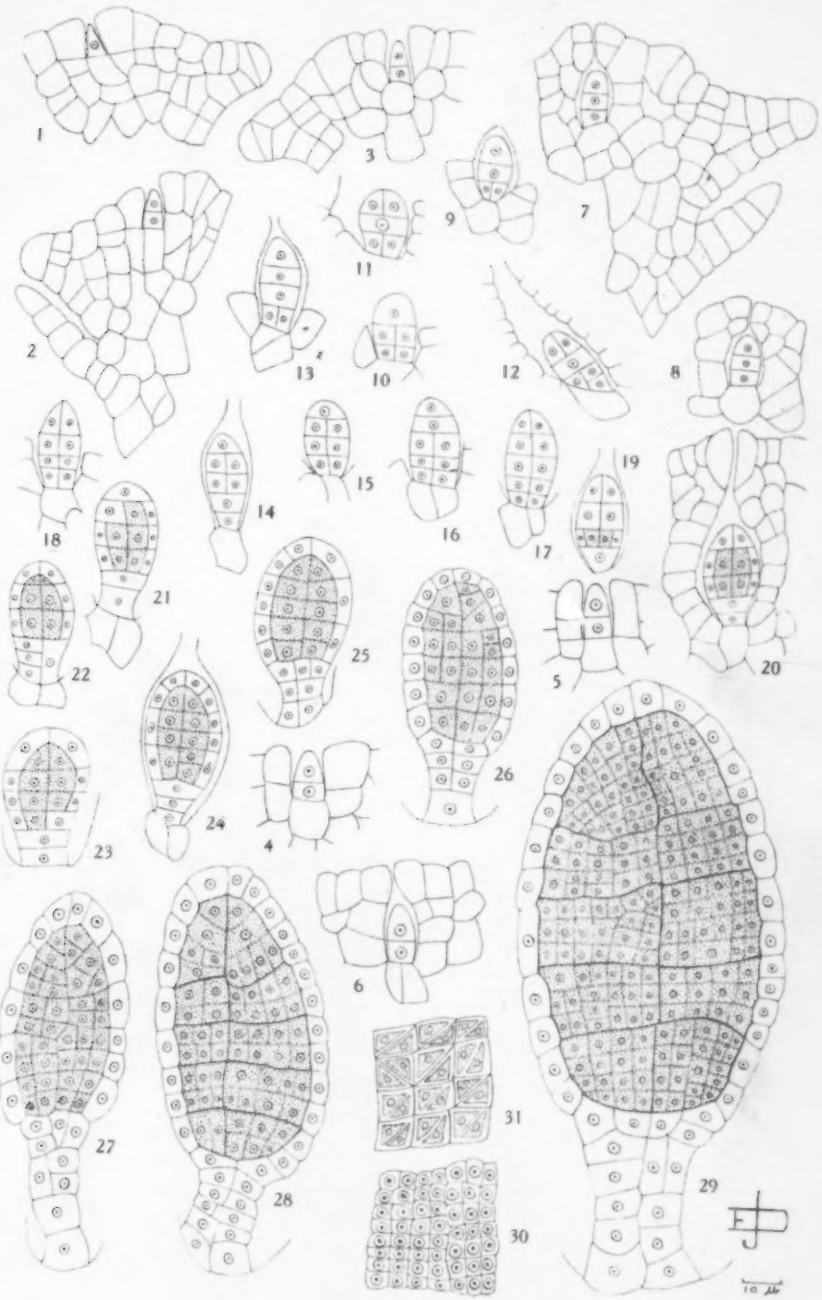


LYCOPERDON SCULPTUM Harkness



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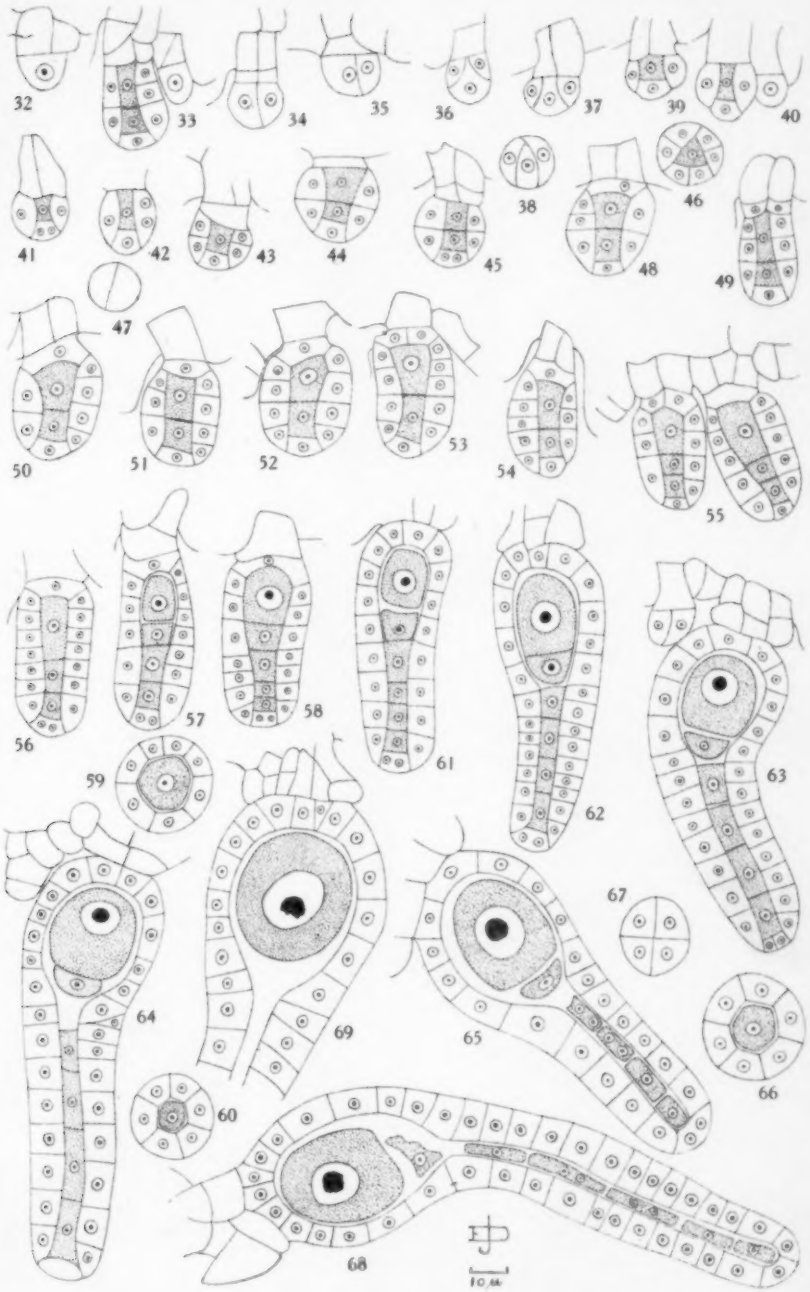

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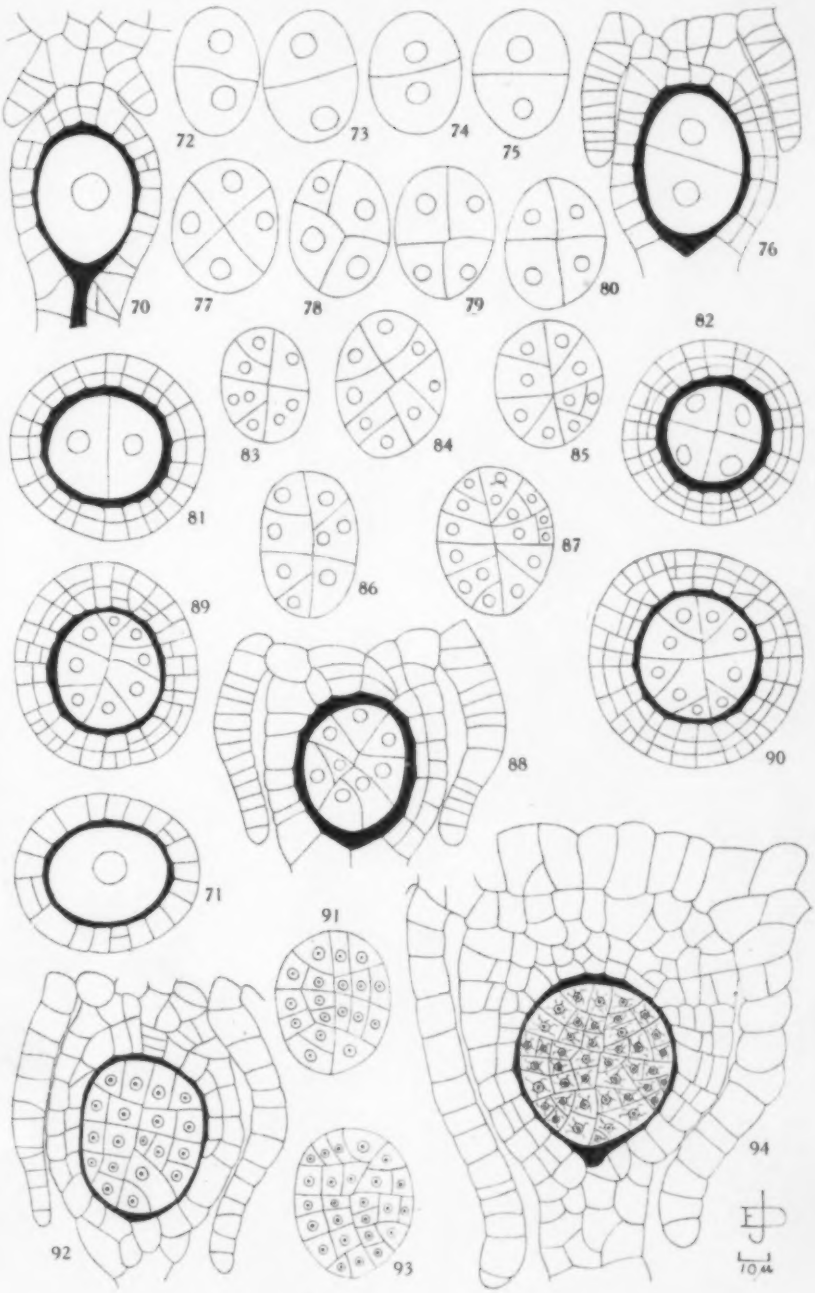

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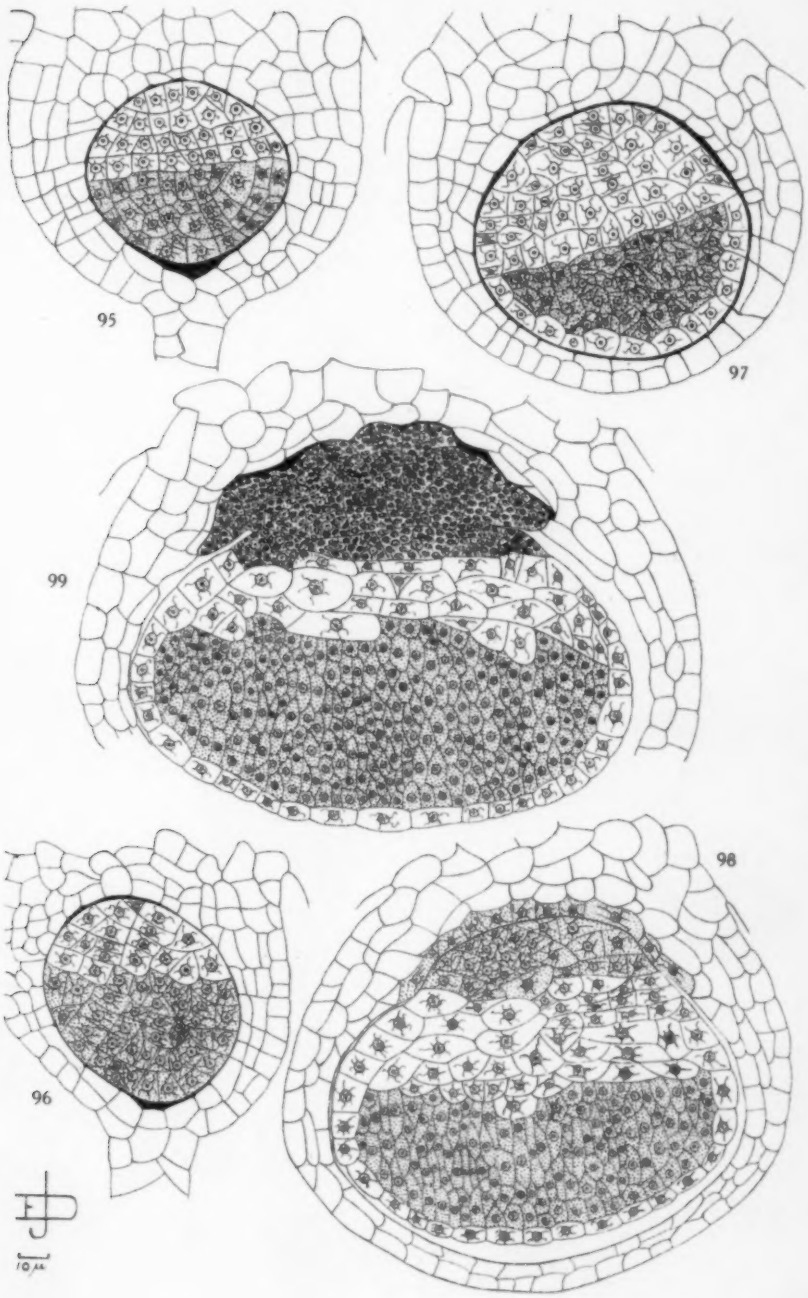

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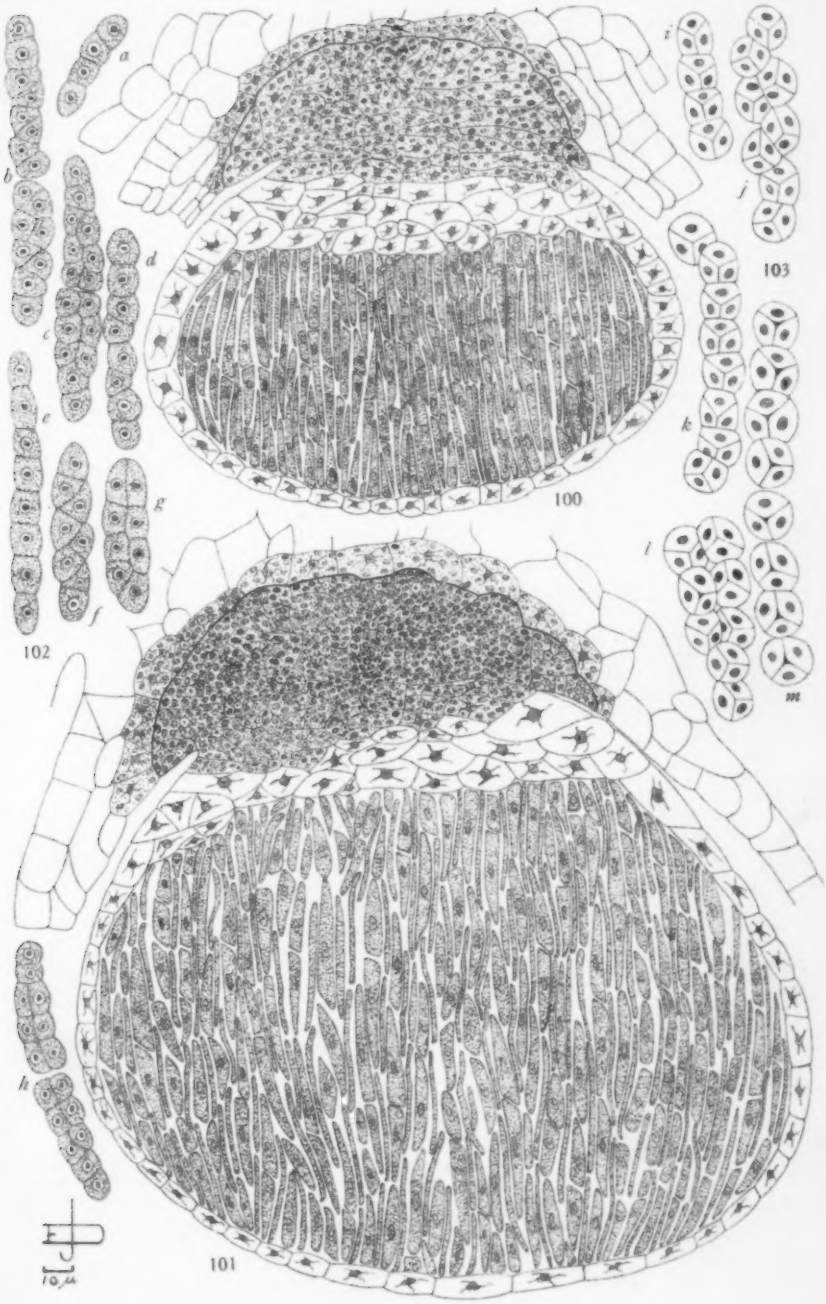

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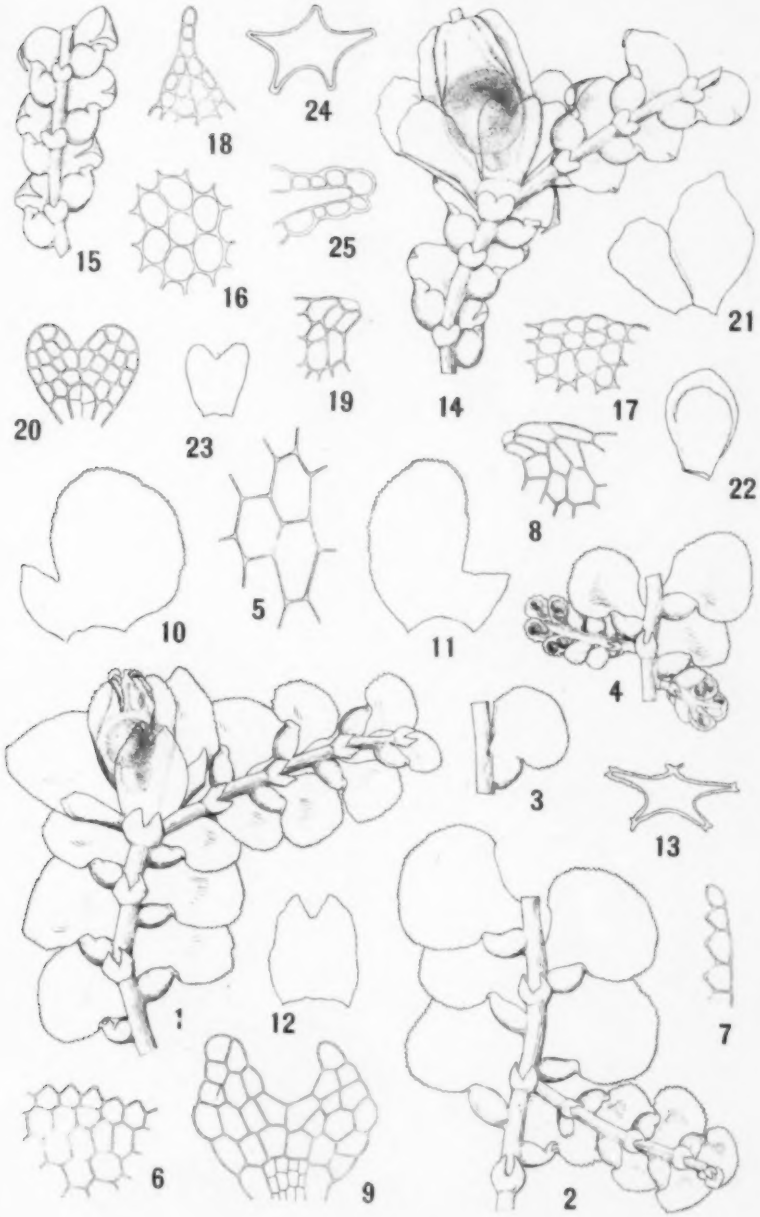
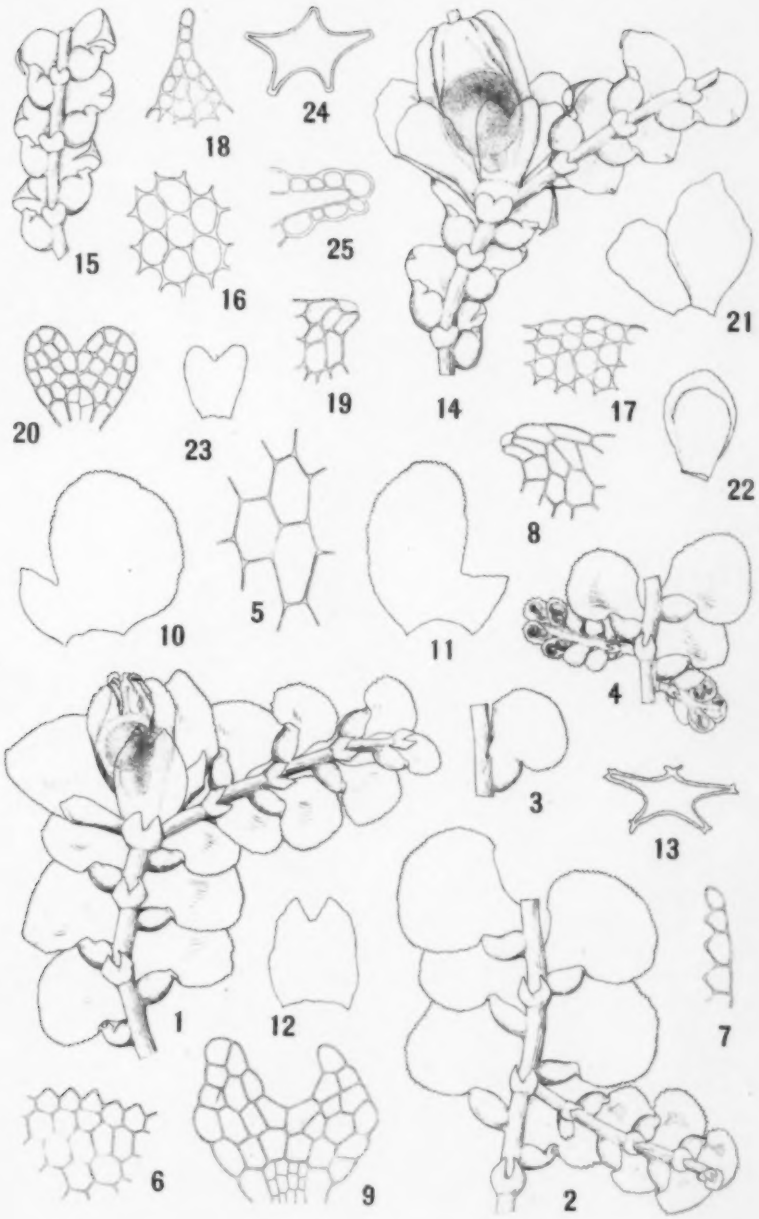


1-13. TRACHYLEJEUNEA DILATATA Evans

14-25. HARPALEJEUNEA REFLEXULA Evans

CRCKAYNE, BOSTON



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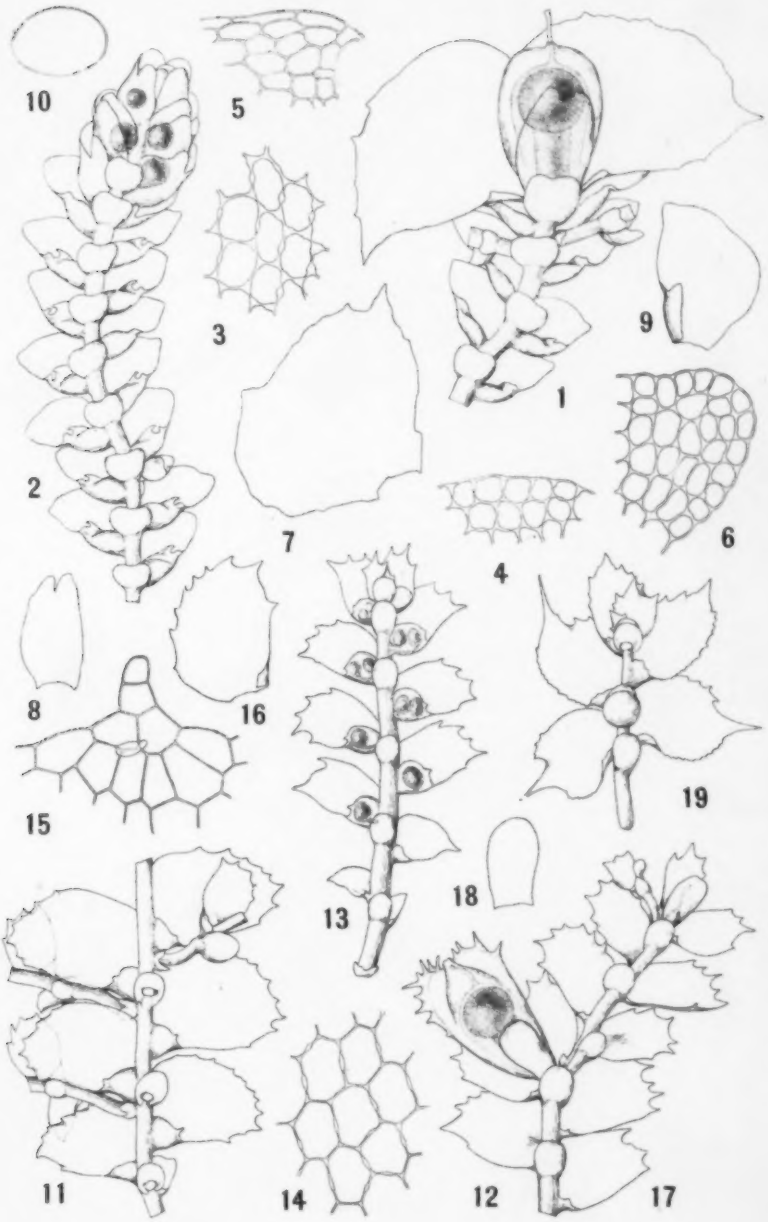

1-10. LEIOLEJEUNEA GRANDIFLORA Evans

11-19. ODONTOLEJEUNEA LONGISPICA Evans

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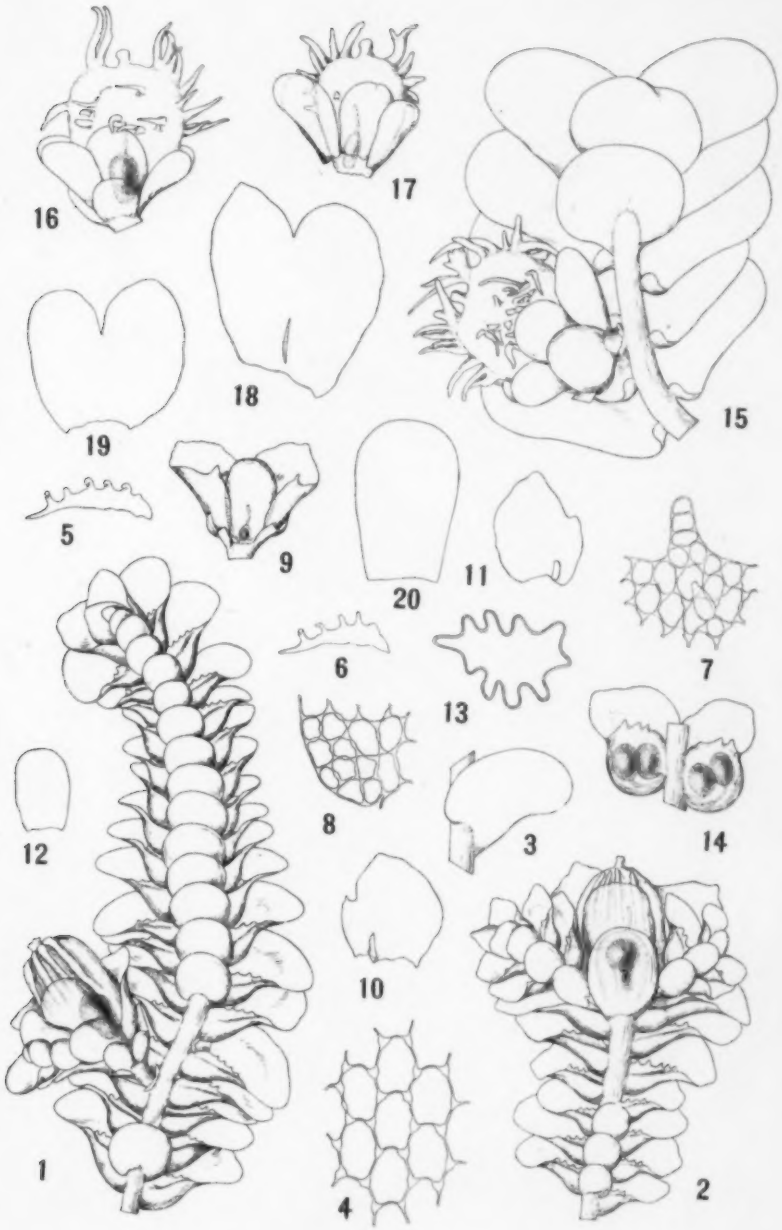

1-14. BRACHIOLEJEUNEA BAHAMENSIS Evans

15-20. SYMBIEZIDIUM LACERATUM Evans

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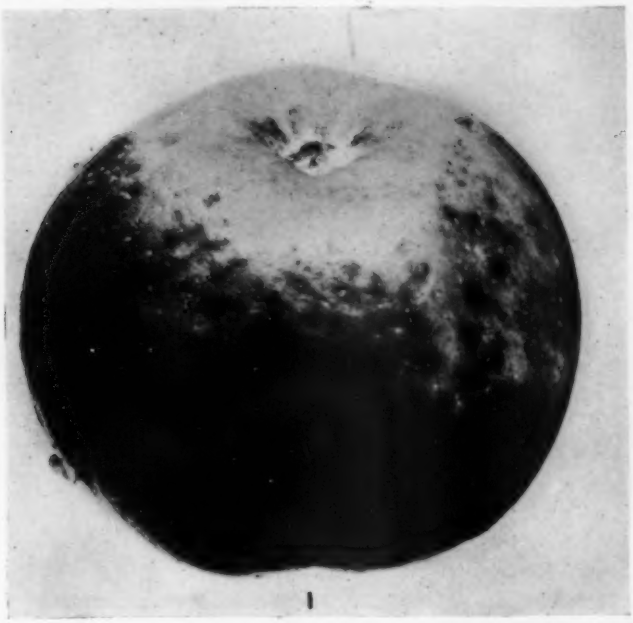

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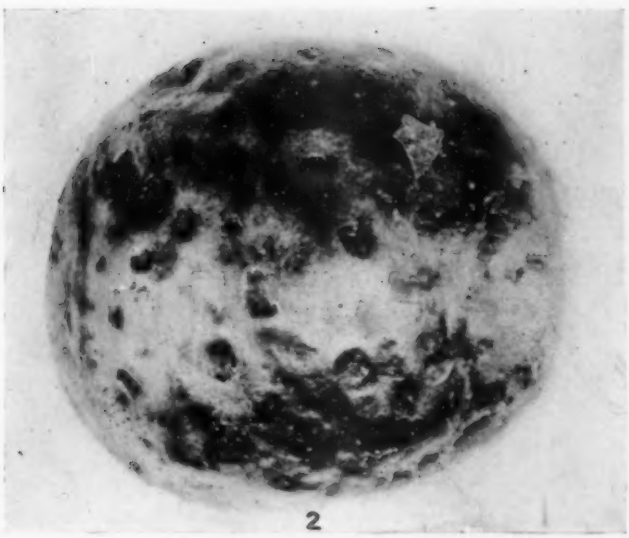

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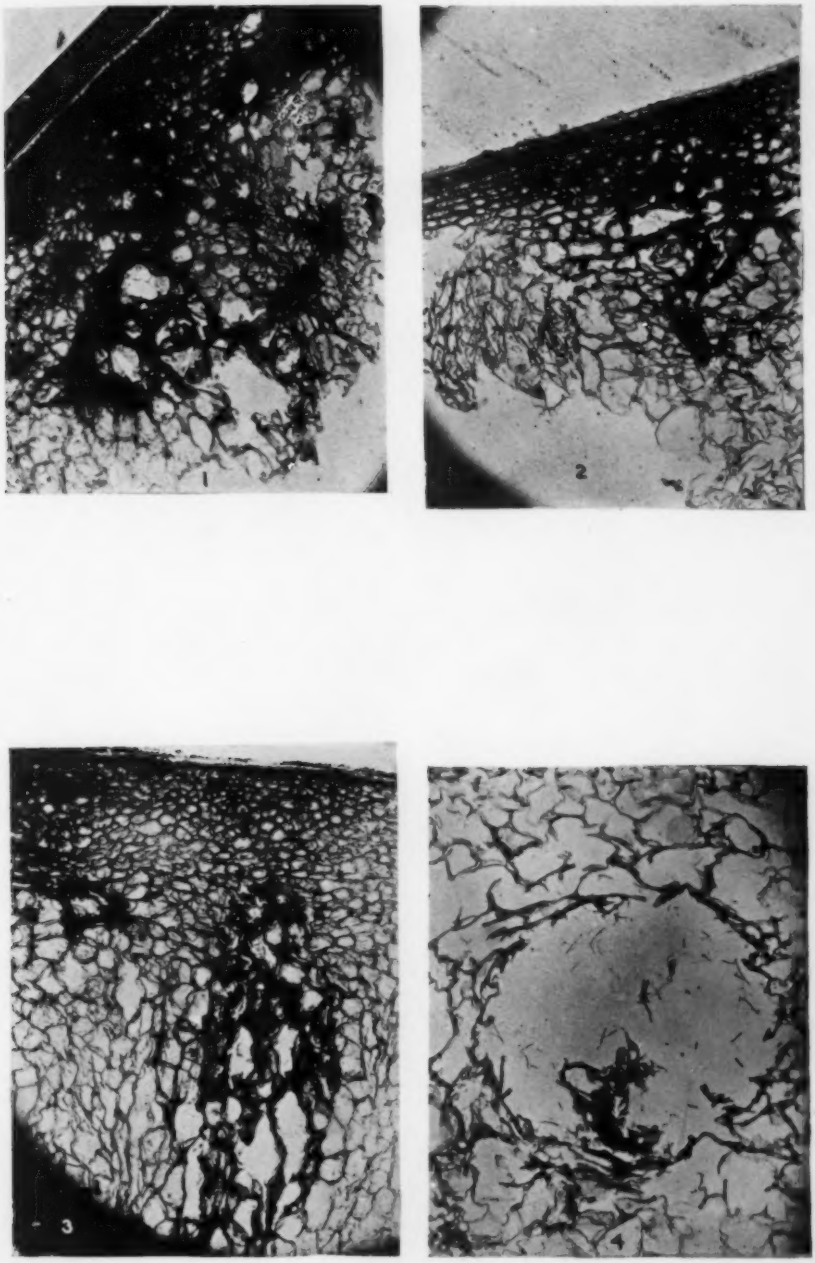

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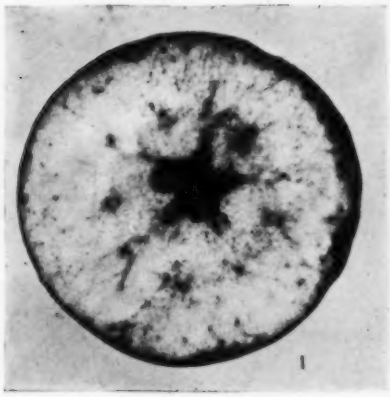

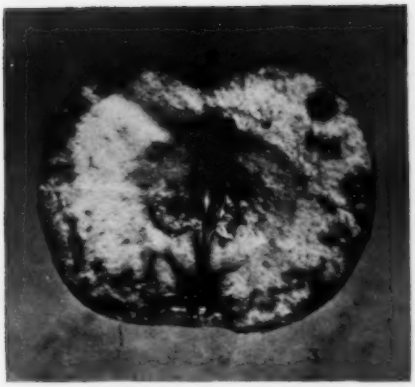

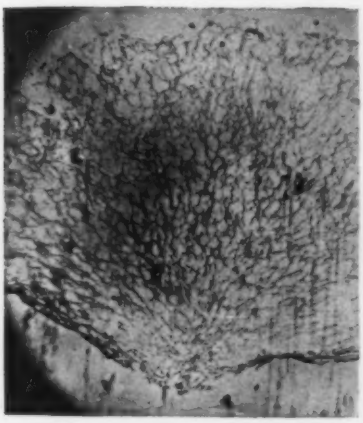

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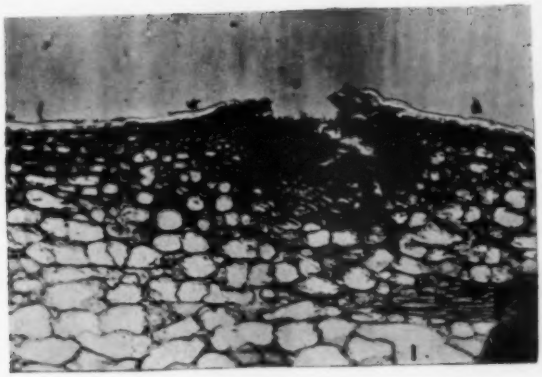

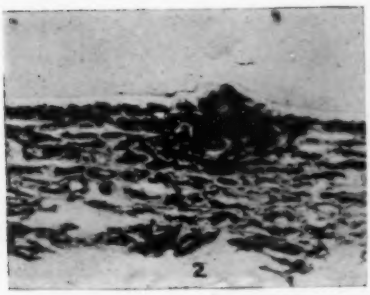

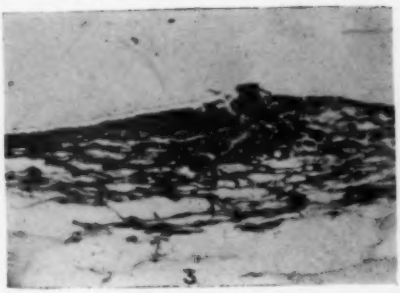

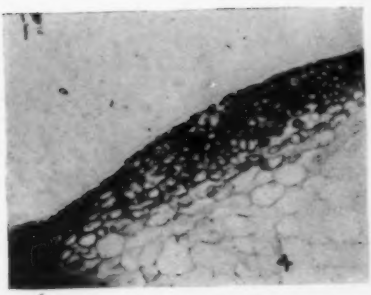

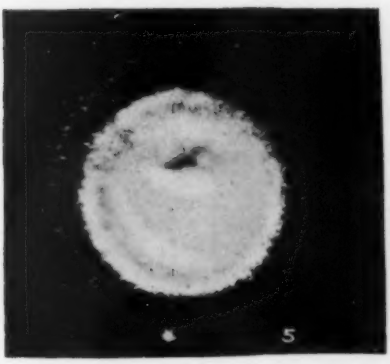

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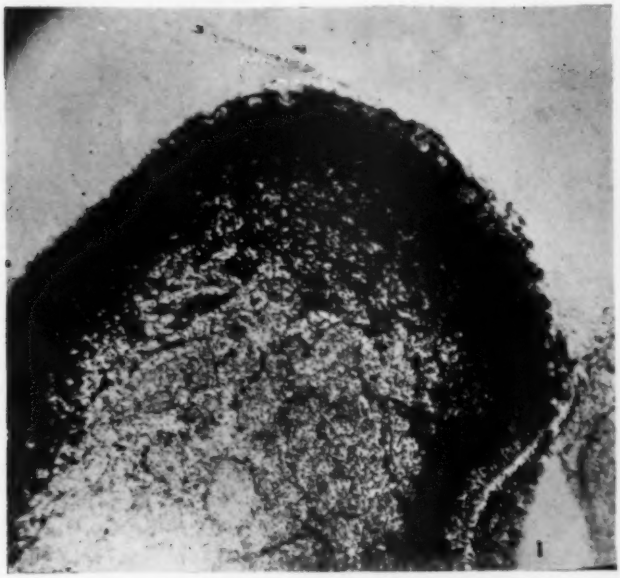

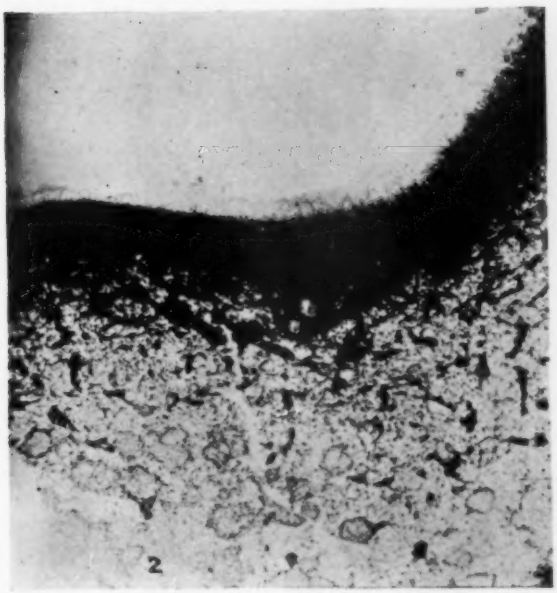

BROOKS, THE FRUIT SPOT OF APPLES

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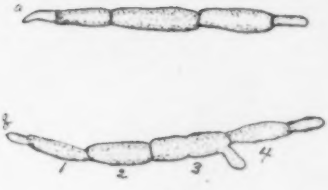

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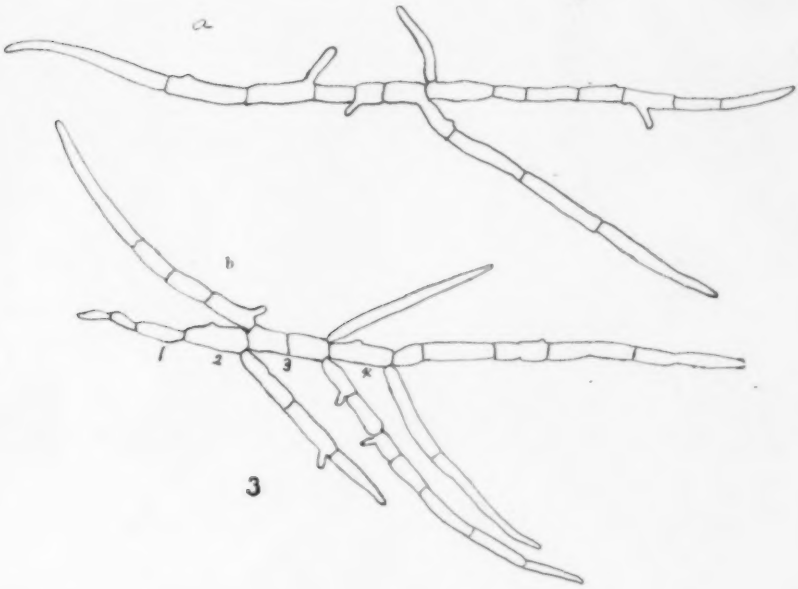

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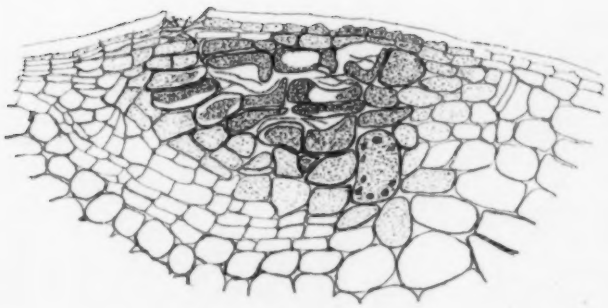

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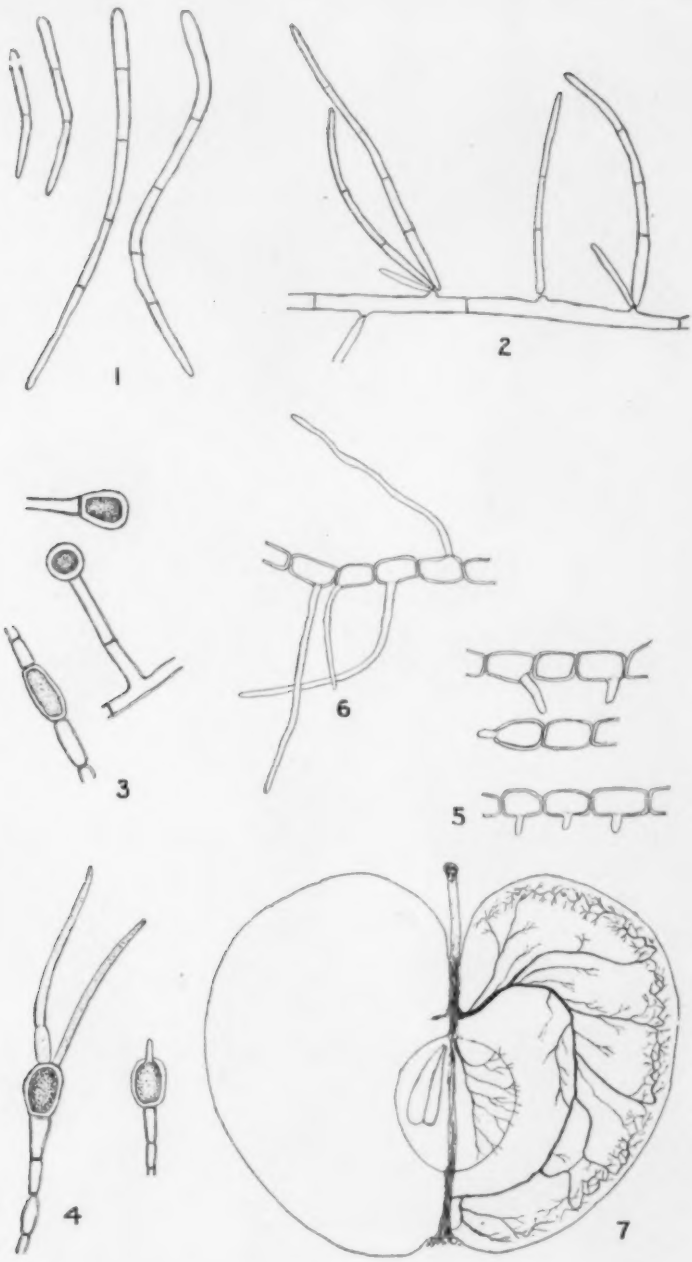
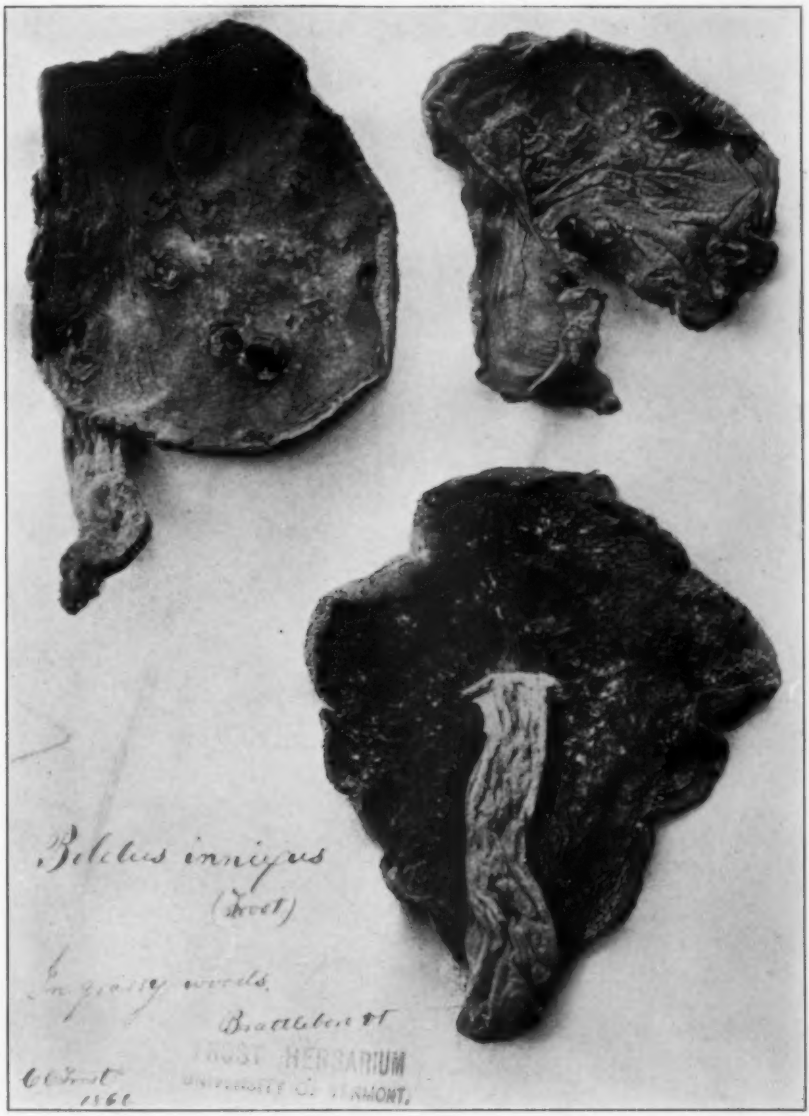


BROOKS, THE FRUIT SPOT OF APPLES

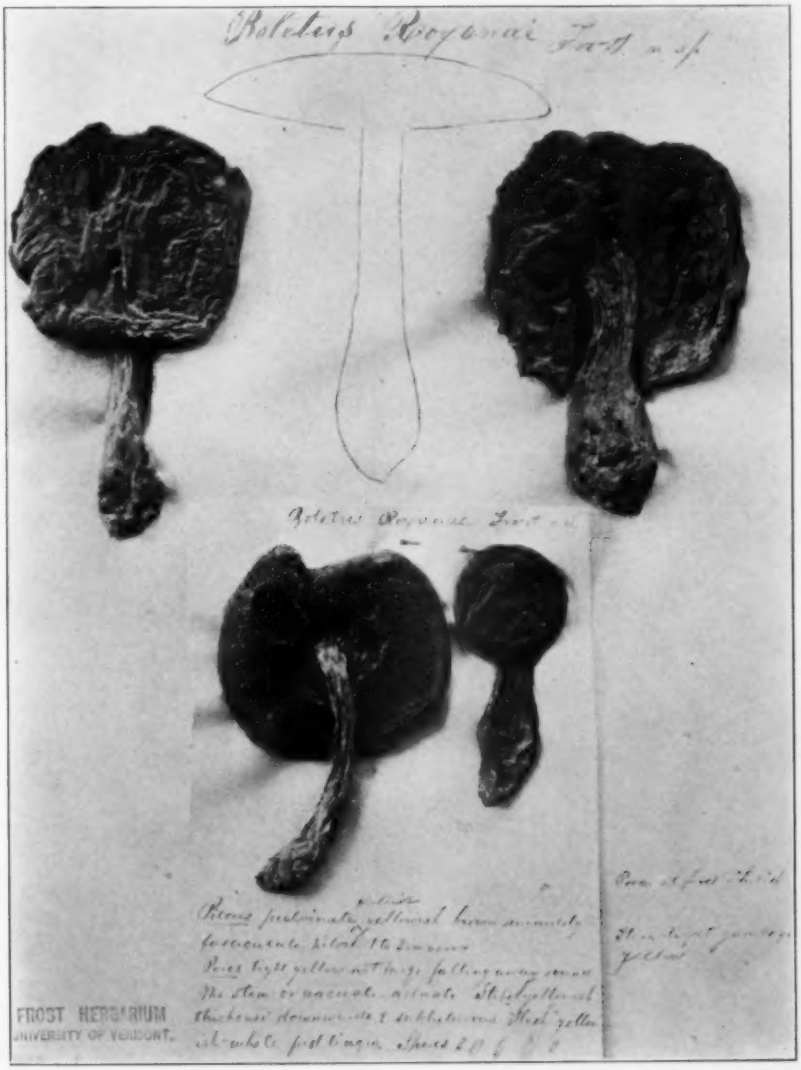
Boletus ferrugineus
Pileus pulvinate, soft dark reddish brown subtomentose
Tubes & Pores at first dirty white, mouths brownish
by the spores, adnate generally. Stem short, reticulated,
dark brown sometimes slightly tuberous Flesh perfectly
white, unchanging.
October 1867 under Oak trees near borders of Woods
FROST HERBARIUM
UNIVERSITY OF VERMONT.

BOLETUS FERRUGINEUS Frost (×$\frac{2}{3}$)



BOLETUS INNIXUS Frost ($\times \frac{7}{8}$)

BOLETUS PALLIDUS Frost (×½)



BOLETUS ROXANAE Frost ($\times \frac{5}{6}$)

BOLETUS RUSSELLII Frost (×⅔)

th

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VOL. 35 DECEMBER, 1908 NO. 12

BULLETIN

OF THE

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THE NEW ERA PRINTING COMPANY
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WILLIAM MANSFIELD, COLLEGE OF PHARMACY, 115 W. 68th St., N. Y. City.

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It will be published in parts at irregular intervals by the New York Botanical Garden through the aid of the income of the David Lydig Fund bequeathed by Charles P. Daly.

It is planned to issue parts as rapidly as they can be prepared, the extent of the work making it possible to commence publication at any number of points. The completed work will form a series of volumes with the following sequence:

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Volume 2 to 10. Fungi.

Volumes 11 to 13. Algae.

Volumes 14 and 15. Bryophyta.

Volume 16. Pteridophyta and Gymnospermae.

Volumes 17 to 19. Monocotyledones.

Volumes 20 to 30. Dicotyledones.

The preparation of the work has been referred by the Scientific Directors of the Garden to a committee consisting of Dr. N. L. Britton, Dr. W. A. Murrill and Dr. J. H. Barnhart.

Professor George F. Atkinson, of Cornell University, Professors Charles R. Barnes and John M. Coulter, of the University of Chicago, Mr. Frederick V. Coville, of the United States Department of Agriculture, Professor Edward L. Greene, of the United States National Museum, Professor Byron D. Halsted, of Rutgers College, and Professor William Trelease, of the Missouri Botanical Garden, have consented to act as an advisory committee.

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